

# Guide for the Establishment of National CDM Authorities

Helena Olivas, the Program Director for the Center of Sustainable Development in the Americas (CSDA), coordinated this effort. CSDA would like to give a special acknowledgement to all the authors, co-authors, and editors that have contributed their time and knowledge to this effort. Special thanks to: Evan Evans, Julie Doherty, Patricia Vasquez, Edward Hoyt, John Paul Moscarella, Marcos Castro, Matthew Mendis, Peter Kalas, and our Canadian Youth Program interns Jimena Eyzaguirre and Mary Gowan, and intern Nicole Kalas.

By:

Please be advised that the information in this guide may change according to the development of the international negotiations in climate change. Also, please check periodically on the development of the current and future AIJ/CDM national authorities.



November 2001

## TABLE OF CONTENTS

Transportation .....	72
Ruminants.....	75
Waste Management .....	76
Conclusion .....	81
References.....	82
Chapter 7: Carbon Finance.....	83
Introduction .....	83
Financing Barriers.....	92
Incremental Cost or Additionality Framework .....	94
Prices and volumes of CERS .....	95
Appendix I - Glossary.....	100
Appendix II.....	118
Existing National JI/CDM Programs in Latin America .....	118
Appendix III .....	120
Project Design Document.....	120
Appendix IV .....	123
National Criteria for Submission of CDM Projects .....	123
Appendix V.....	134
Countries that have signed/ratified the Kyoto Protocol .....	134
Quantified emission reduction obligations of Annex I countries .....	136
Chapter 3: Evolution of National CDM Authorities.....	29
Introduction.....	29
Historical Evolution of Latin American AJ/CDM Entities .....	29
A Comparison of Key Features .....	39
Challenges of Institutionalization .....	40
Conclusion.....	42
Chapter 4: Institutional Building of National CDM Authorities .....	44
Introduction.....	44
<b>Role of a CDM National Authority .....</b>	<b>Error! Bookmark not defined.</b>
Before Creating a National CDM Entity .....	44
Steps in Creating a National CDM Authority .....	47
Chapter 5: Functions of a National CDM Authority .....	53
Introduction.....	53
Evaluation and Approval .....	53
Capacity Building for CDM Project Development .....	58
Marketing CDM Projects.....	63
Chapter 6: Types of Projects .....	68
Introduction.....	68
Energy Generation .....	68
Energy Efficiency .....	69
Chapter 1: Science and Policy .....	3
Introduction.....	3
The Climate Change Challenge .....	3
History of the Negotiations.....	10
The Evolution of the CDM.....	15
Chapter 2: The Operation of the CDM .....	21
Introduction.....	21
The CDM and Sustainable Development .....	21
Criteria for Participation .....	22
Governance and share of proceeds .....	22
The CDM Project Cycle.....	23
Conclusion.....	27
Chapter 3: Evolution of National CDM Authorities.....	29
Introduction.....	29
Historical Evolution of Latin American AJ/CDM Entities .....	29
A Comparison of Key Features .....	39
Challenges of Institutionalization .....	40
Conclusion.....	42
Chapter 4: Institutional Building of National CDM Authorities .....	44
Introduction.....	44
<b>Role of a CDM National Authority .....</b>	<b>Error! Bookmark not defined.</b>
Before Creating a National CDM Entity .....	44
Steps in Creating a National CDM Authority .....	47
Chapter 5: Functions of a National CDM Authority .....	53
Introduction.....	53
Evaluation and Approval .....	53
Capacity Building for CDM Project Development .....	58
Marketing CDM Projects.....	63
Chapter 6: Types of Projects .....	68
Introduction.....	68
Energy Generation .....	68
Energy Efficiency .....	69

# Chapter 1: Science and Policy

Written by: Jimena Eyzaguirre and Nicole Kalas

industrialized nations can apply towards meeting their own reduction targets.

## The Climate Change Challenge

### Discovery of Climate Change

#### Introduction

The global climate is changing, and evidence increasingly points to human activities as the cause. We are beginning to understand the possible catastrophic implications of this change, but cannot predict with undisputed certainty where and when they are going to take place. It is certain, though, that industrialized countries carry the major part of historical responsibility and that developing countries will assume the major burden of the imminent negative impacts, due to their particular vulnerability in their geographical location, as well as economic, political, social and environmental spheres.<sup>4</sup>

The United Nation's Framework Convention on Climate Change (UNFCCC) provides the outline of a global action plan to mitigate our adverse effects on the atmosphere. The Kyoto Protocol was designed to further strengthen the provisions of the UNFCCC, and introduced flexible mechanisms that would allow a reduction of greenhouse gas emissions in the most cost-effective, efficient and sustainable manner. Of these instruments, the Clean Development Mechanism (CDM) is of greatest interest to the developing world. It allows the channeling of foreign investment to these countries to further sustainable development and abate greenhouse gas emission while generating certified emission reduction units (CERs) that

Incoming high-energy short-wave solar radiation passes through the clear atmosphere largely undisturbed and is absorbed by the surface; some solar radiation bounces back into the universe by virtue of the Earth's reflective properties. Conversely, the Earth's atmosphere absorbs most low-energy long-wave radiation emitted from the surface.<sup>1</sup> The concentration and composition of gases present in the atmosphere, therefore, have an important function in determining the balance between the incoming and outgoing infrared radiation. This phenomenon is called the greenhouse effect by the simplified analogy to the behavior of glass panes in a greenhouse,<sup>2</sup> first made by Jean-Baptiste Fourier in 1827.<sup>3</sup> The surface of the Earth would be about 33°C cooler, were it not for the presence of the naturally occurring infrared-trapping atmospheric gases.<sup>4</sup>

The most important contributor to the natural greenhouse effect is water vapor.<sup>5</sup> However, atmospheric water vapor concentrations have not directly increased in relation to

<sup>1</sup> Roberts, N. "The global environmental future." In The changing global environment. 1994. 1-28.

<sup>2</sup> MacDonald, G. "Scientific basis for the greenhouse effect." In The challenge of global warming. 1989. 123-145.

<sup>3</sup> IPCC, Second Assessment Report. 1995.

<sup>4</sup> Fitter, J. "Greenhouse effects and impacts on physical systems." In The challenge of global warming. 1989. 113-122.

<sup>5</sup> Schneider, S.H., ed. Laboratory Earth: The planetary gamble we can't afford to lose. 1997.

human activities.<sup>6</sup> Water vapor acts as a positive feedback mechanism. Feedbacks are responses to system inputs. Mechanisms can reinforce the input (positive feedback) or can counteract the input (negative feedback). Since higher mean temperatures enhance the atmosphere's ability to hold water vapor, models predict an enhanced greenhouse effect.<sup>7</sup> For example, warming may lead to elevated precipitation levels because of the increased ocean to atmosphere moisture flux. However, higher precipitation rates would not necessarily increase soil moisture because of higher rates of evaporation.

Unlike water vapor, human activity greatly contributes to the increased concentrations of carbon dioxide into the atmosphere. Current measurements indicate that human activities are responsible for an annual atmospheric emission of six billion metric tons of carbon in the form of 22 billion tons of CO<sub>2</sub>.<sup>8</sup> We believe that the concentration of atmospheric carbon dioxide is regulated by the exchange between the atmosphere, oceans and land vegetation. However, the rates of CO<sub>2</sub> exchange between these spheres are typically slow in comparison to the rates of CO<sub>2</sub> emission into the atmosphere. For tens of thousands of years this complex cycle has experienced few disruptions, and carbon dioxide levels have remained relatively constant. In a matter of less than 200 years, with the advent of industrialization, carbon dioxide levels have increased 25 to 30%.<sup>9</sup> Historically,

even slight changes in the atmosphere's composition were life threatening to plants and animals.<sup>10</sup>

In the mid-eighteen hundreds, the English physicist John Tyndale made the observation that slight changes in the composition of the Earth's atmosphere could effect global climate changes; any decrease in atmospheric carbon dioxide concentrations would lead to the development of an ice age.<sup>11</sup> Based on laboratory tests, Arrhenius concluded in 1896 that fossil fuel combustion would produce warming between 4 and 6 °C.<sup>12</sup> In 1938, G. Callendar fully described the negative effects of fossil fuel combustion on the atmosphere.<sup>13</sup> However, concern was diminished by the popular thought that the development of nuclear technology would curtail our dependence on fossil fuels.<sup>14</sup> Actual atmospheric measurements were not initiated until 1958 when C.D. Keeling of the Scripps Institution of Oceanography set up an atmospheric carbon dioxide monitoring station in Mauna Loa, Hawaii. The data collected show an exponential growth in atmospheric CO<sub>2</sub> with time, which is corroborated by measurements in an Antarctic monitoring station (Figure 1.1).<sup>15</sup>

<sup>6</sup> Roberts, N. "The global environmental future." In The changing global environment. 1994. 1-48.

<sup>7</sup> Roberts, N. "The global environmental future." In The changing global environment. 1994. 1-48.

<sup>8</sup> Chatterjee, K. "Causes of greenhouse gas emissions." In Climate change: An integrated perspective. 1999. 143-200.  
<sup>9</sup> Street-Perrott, F.A. and Roberts, N. "Past climates and future greenhouse warming." In The changing global environment. 1994. 48-67. According to the IPCC Third Assessment Report (2000) Executive Summary the atmospheric concentration of carbon dioxide has increased by 31% since 1750.

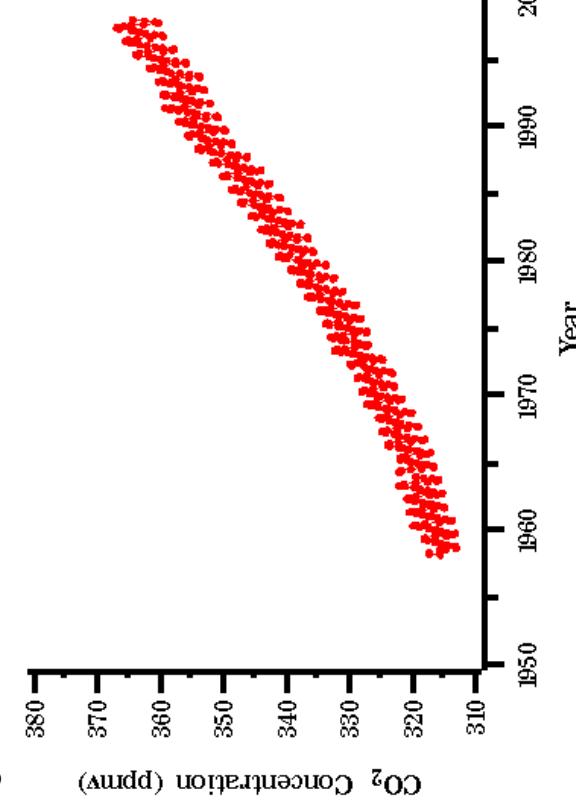
<sup>10</sup> Flavin, C. and Tunali, O. eds. Climate of Hope: New strategies for the stabilizing the world's atmosphere. 1996.

<sup>11</sup> Macdonald, G. "Scientific basis for the greenhouse effect." In The challenge of global warming. 1989. 123-145.

<sup>12</sup> IPCC, Second Assessment Report. 1996

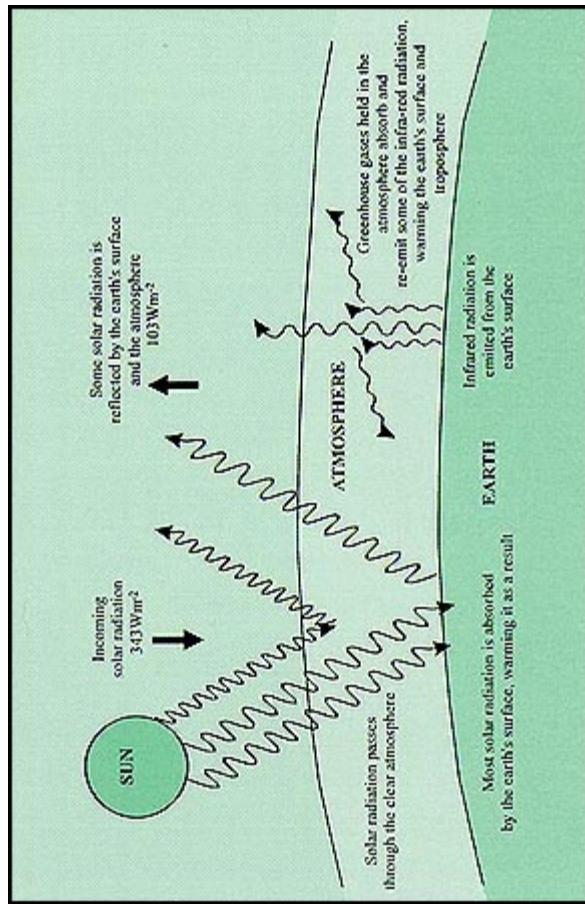
<sup>13</sup> Callendar, G. "The artificial production of carbon dioxide and its influence on temperature." Quarterly Journal of the Royal Meteorological Society. 1938. 64, 223-237.  
<sup>14</sup> IPCC, Second Assessment Report. 1996  
<sup>15</sup> Keeling, C. "Atmospheric CO<sub>2</sub> concentration, Mauna Loa Observatory, Hawaii, 1958-1983." U.S. Department of Energy Report NDP-001. 1984. Carbon Dioxide Information Center, Oak Ridge, Tennessee.

Figure 1.1



percent is reflected back into space by the albedo effect, namely the Earth's reflectivity, determined by cloud cover, deserts and ice caps (Figure 1.2).<sup>17</sup> The rest of the incoming solar radiation balances out over a year's time by the outgoing terrestrial radiation; both quantities are determined by the properties of the Earth's surface and atmosphere.<sup>18</sup> For this reason changes in greenhouse gas concentrations are able to influence the Earth's climate.<sup>19</sup>

Figure 1.2



Source: Dave Keeling and Tim Whorf (Scripps Institution of Oceanography)

The graph shows the general trend of increasing CO<sub>2</sub> concentration with time, inflections in this trend (which are unexplained) and small-scale annual oscillations. The peaks in the small-scale oscillations represent the release during winter months of carbon into the atmosphere due to plant respiration. During summer months, plants tend to store carbon.

## The Atmosphere and the Greenhouse Effect

The balance between the incoming solar radiation and the outgoing terrestrial radiation regulates the Earth's climate, in part.<sup>16</sup> Of the incoming solar radiation, about thirty

<sup>17</sup> <http://www.unfccc.int/resource/iuckit/fact02.html>

<sup>18</sup> Schneider, S.H., ed. Laboratory Earth: The planetary gamble we can't afford to lose. 1997.

<sup>19</sup> "The Scientific Consensus. Villach (Austria) Conference." In The challenge of global warming. 1989. 123-145.

The atmosphere is a layer of gas about 50 km thick composed of: 78% nitrogen, 21% oxygen and 1% of other trace gases.<sup>20</sup> The natural greenhouse effect is produced by some of the trace gases, including water vapor ( $H_2O$ ), carbon dioxide ( $CO_2$ ), methane ( $CH_4$ ), nitrous oxide ( $N_2O$ ) and ozone ( $O_3$ ); these gases are naturally occurring. Chlorofluorocarbons (CFCs), which are synthetic gases, also act as greenhouse gases. Although CFCs are currently being phased out through the Montreal Protocol, the chemicals created as replacements, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride ( $SF_6$ ), though less damaging to the ozone layer,<sup>21</sup> have been proven to be powerful greenhouse gases.<sup>21</sup> The greenhouse gases with which the Kyoto Protocol is concerned are: carbon dioxide, methane, nitrous oxide, HFCs, PFCs and sulfur hexafluoride.<sup>22</sup>

The accumulation of atmospheric heat-trapping gases is a consequence of the disruption of the global carbon cycle.<sup>23</sup> Even though oceans and land-based vegetation (carbon “sinks”) absorb carbon dioxide the excess carbon is driven into the atmosphere, which acts as a positive feedback since it cannot be balanced. Polar ice core data coupled with Keeling’s observations indicate that the concentration of atmospheric carbon dioxide has increased from 290 ppmv (parts per million volume) to about 345ppmv from 1886 to 1986.<sup>24</sup> Carbon dioxide emissions have increased radically because of fossil fuel combustion spurred by the industrial

revolution since the late nineteenth century. Industrialization triggered an unprecedented demand for fossil fuels as sources of energy for newly developed machinery, transportation and households. Global population has also increased at rapid rates, which fosters agricultural activity as well as fossil fuel, timber and fodder consumption.<sup>25</sup>

Focus is placed on the rising levels of atmospheric carbon dioxide, however, the radiative effects of the increase in other greenhouse gases, compounded with  $CO_2$  concentrations would mean a doubling of pre-industrial concentrations as early as 2030.<sup>26</sup> Methane levels, for example, have risen 145% since pre-industrial times.<sup>27</sup> Methane is emitted when organic matter decays in the (near) absence of oxygen and as a result of fossil fuel processing. Sources include swamps, rice fields, waste dumps and the digestive tracts of cattle and termites.<sup>28</sup>

Nitrous oxide is a by-product of fossil fuel combustion and nitrogen based fertilizers. The concentration levels of this gas are not as elevated as methane or carbon dioxide, however, nitrous oxide has a comparatively long atmospheric lifetime giving it greater global warming potential (Table 1.1).

Trace gas	Chemical formula	Atmospheric lifetime	Pre-industrial concentration	Concentration in 1994
-----------	------------------	----------------------	------------------------------	-----------------------

<sup>20</sup> Jansen, D. “The climate system.” In Climate change: An integrated perspective. 1999. 11-50.

<sup>21</sup> Flavin, C. and Tunali, O. eds. Climate of hope: New strategies for stabilizing the world's atmosphere. 1996.

<sup>22</sup> Annex A. The Kyoto Protocol to the Convention on Climate Change. 1997.

<sup>23</sup> Woodwell, G.M. “Biotic causes and effects of the disruption of the global carbon cycle.” In The challenge of global warming. 1989. 71-81.

<sup>24</sup> From, E. and Keeling, C. “Reassessment of late 19<sup>th</sup> century atmospheric carbon dioxide variation in the air of Western Europe and the British Isles based on unpublished analysis of contemporary air masses by C.S. Callendar.” Tellus 1986: 38B, 87-105.

<sup>25</sup> Roberts, N. “The global environmental future.” In The changing global environment. 1994. 1-48.

<sup>26</sup> “The Scientific Consensus. Villach (Austria) Conference.” In The challenge of global warming. 1989.

<sup>27</sup> Roberts, N. “The global environmental future.” In The changing global environment. 1994. 1-48. According to the IPCC Third Assessment Report’s (2000) Executive Summary methane concentrations have risen by 151% since 1750.

<sup>28</sup> Firor, J. “Greenhouse effects and impacts on physical systems.” In The challenge of global warming. 1989. 113-122.

would be 1-2.5°C warmer than in pre-industrial times.<sup>31</sup>

Although some scientists and policy makers still question the direct correlation between the increase in atmospheric greenhouse gases and global warming, all evidence points in that direction. We now recognize that of all anthropogenic activities none have caused as much damage to the atmosphere as the inputs produced by energy use and agriculture. The IPCC concluded in its Second Assessment Report (1996) that there is a "discernible human impact on the global climate". Furthermore, the Executive Summary of the IPCC Third Assessment Report (2001) affirms the progress made since the Second Assessment Report with respect to new and more compelling evidence, which attributes recent warming to human activities.

Source: Jansen, D. (1999) In Climate Change: An integrated perspective. Concentrations are expressed in parts per million, billion, trillion volume.

The rest of the greenhouse gases (HFCs, PFCs, SF<sub>6</sub>, etc.) are synthetic; they came into use in the 1960s for industrial processes such as insulation and cooling. These gases also have a long atmospheric residence time.<sup>29</sup>

		(years)	
Water vapor	H <sub>2</sub> O	On a scale of weeks	Varies strongly
Carbon dioxide	CO <sub>2</sub>	50 - 200	280 ppmv
Methane	CH <sub>4</sub>	12	0.70 ppmv
Nitrous oxide	N <sub>2</sub> O	120	275 ppbv
Perfluorocarbon	CF <sub>4</sub>	50	0
bon			72 pptv
CFC-11	CCl <sub>3</sub> F	50	0
CFC-12	CCl <sub>2</sub> F <sub>2</sub>	102	0
CFC-13	CH <sub>2</sub> FC-CCl <sub>2</sub> F <sub>2</sub>	85	0
HCFC-22	CHClF <sub>2</sub>	12	0

## Climate Forcing Mechanisms

Climate forcing mechanisms are factors that compel changes in climate. In general, we try to distinguish natural variations from anthropogenic climate forcings.

### Natural factors affecting global climate include:

- Variations in the Earth's orbit: The shape of the Earth's orbit, which determines the amount and distribution of incident sunlight, is a climate forcing mechanism. Short-term seasonal variations are a result of these factors, as are the glacial cycles on geological time-scales. Through the albedo effect, some of the incident sunlight is directly reflected back. The remaining solar radiation is re-distributed through atmospheric and oceanic circulation. Winds are generated by temperature differences between one place and another in the atmosphere; heat drives fluid

<sup>29</sup> MacDonald, G. "Scientific basis for the greenhouse effect." In The challenge of global warming. 1989. 123-145.  
<sup>30</sup> Houghton et al. Climate change 1995: the science of climate change. 1995.

<sup>31</sup> Allen, M.R. et al. "Quantifying the uncertainty in forecasts of anthropogenic climate change." In Nature. 2000: 407, 617-620.

circulation. Therefore, changes in solar energy available to the Earth's surface will tend to generate changes in atmospheric and oceanic temperatures along with subsequent alterations in weather and circulation patterns.<sup>32</sup>

■ **Variations in solar energy:** The variation in the amount of solar energy output can also influence climate change. However, measurements show that in an average eleven-year sunspot (magnetic storms manifested as cooler regions on the solar surface) cycle solar radiation fluctuates only about 0.1%.<sup>33</sup> This variability alone does not explain the global temperature record.<sup>34</sup>

■ **Volcanic activity:** Volcanic activity releases gases like sulfur dioxide into the stratosphere where it is converted into aerosols. Particulates linger in the atmosphere, temporarily (i.e. a few years) blocking out solar radiation, which tends to cool the Earth's surface and lower atmosphere.<sup>35</sup>

#### **Anthropogenic factors affecting global climate change:**

■ **Land use changes and agriculture:** Land use changes can disrupt the nature of the weather systems upon which the ecosystem depends. Since forested land evaporates more water and breathes more carbon dioxide, oxygen and water than cleared land, deforestation causes changes in evapotranspiration

rates.<sup>36</sup> Surface runoff increases with deforestation. The increase in global population has led to the conversion of forests into agricultural systems. Deforestation has an impact on climate since forests aid in the regulation of carbon, nitrogen and oxygen budgets and also protect soils, which are involved in the hydrological cycle. Data show that unmanaged forests have a greater carbon storing capacity than agricultural systems.<sup>37</sup> Agricultural practices, i.e. forest clearing, biomass burning, rice cultivation, livestock raising and fertilizer use, contribute to the increase of atmospheric greenhouse gases.

■ **Industrial processes:** According to the IPCC's Second Assessment Report, emissions from the industrial sector account for 20% of global warming.<sup>38</sup> Emissions are not the only negative impact of industrial processes; other concerns include industrial waste and depletion of natural resources.

■ **Energy generation:** Energy generation from conventional sources, i.e. fossil fuel combustion, accounts for about 50% of anthropogenic greenhouse gas emissions, 80% of which are CO<sub>2</sub> emissions.<sup>39</sup> The onset of industrialization and the concomitant population explosion and increase in transportation demand has resulted in a global dependence on fossil fuels and an exponential increase in CO<sub>2</sub> emissions.

■ **Transportation:** The transportation sector has greatly expanded with the advent of industrialization and urbanization along with economic development and

<sup>32</sup> Schneider, S.H., ed. Laboratory Earth: The planetary gamble we can't afford to lose. 1997.

<sup>33</sup> Jansen, D. "The climate system." In Climate change: An integrated perspective.

<sup>34</sup> Karl, T.R. et al. "Testing for bias in the climate record." In Science. 1996. 271, 1879-1883.

<sup>35</sup> Schneider, S.H., ed. Laboratory Earth: The planetary gamble we can't afford to lose. 1997.

<sup>36</sup> Schneider, S.H., ed. Laboratory Earth: The planetary gamble we can't afford to lose. 1997.

<sup>37</sup> IPCC. Second Assessment Report. 1996

<sup>38</sup> IPCC. Second Assessment Report. 1996

<sup>39</sup> IPCC. Second Assessment Report. 1996

improved living standards. The increase in vehicle circulation contributes to noise and air pollution. In fact, fossil fuel combustion in the transport sector amounts to 20% of global carbon emissions.<sup>40</sup>

The activities mentioned above generate approximately seven billion tons of carbon per year, 75% of which are emitted by industrialized nations.<sup>41</sup> Economic, technological and social trends, as well as global population will dictate future greenhouse gas emissions.<sup>42</sup> Given data collected thus far, experimental models and simulations, it seems evident a business-as-usual approach is not an option. In fact, climate experts predict warming of 1.4 to 5.8°C between 1990 and 2100<sup>43</sup>, taking into account atmospheric exchange with oceans and slight cooling effects of aerosols.<sup>44</sup>

## Consequences of Global Warming

Global warming unleashes a series of associated alterations in atmospheric and oceanic circulation and weather patterns. These are a few potential consequences of global warming:

**Rise in sea levels:** Experts believe the most dramatic response to an enhanced greenhouse effect would be the rise in sea levels.<sup>45</sup> Warming affects the hydrosphere in many ways. For example, since water when heated expands thermally (steric effect), sea levels would rise with increasing global mean

temperatures.<sup>46</sup> If ocean temperatures increase, changes in the interaction between the atmosphere and oceans occur, possibly resulting in changing wind patterns. As a consequence, coastlines worldwide will be affected, particularly those composed of unconsolidated sediments. Inhabitants of coastlines and low-lying areas may suffer flooding, land subsidence and compaction, aquifer salinization, exposure to pollution, etc.<sup>47</sup> According to a study by the UNEP, as of 1990 about half of the world's population lived in coastal areas.<sup>48</sup> Estimates indicate that global mean sea level has risen between 0.5 and 3mm per year over the past century. Given a business-as-usual scenario, by the year 2100 sea levels will have risen between 31 and 110 cm, giving a rate of 2.8 to 10mm/year.<sup>49</sup> Melting ice caps and glaciers may also contribute to the rise in sea levels.<sup>50</sup>

**Change in weather patterns:** The increase in global mean temperature produces regionally variable effects. For example, some studies indicate that warming would be greater at high latitudes than in the tropics during winter and fall seasons, although mid-latitude regions would experience more frequent summer dryness.<sup>51</sup> Wind and precipitation patterns are affected by changes in temperature. For

<sup>40</sup> IPCC. Second Assessment Report 1996  
<sup>41</sup> IPCC. Second Assessment Report. 1996  
<sup>42</sup> <http://www.unfccc.int/resource/iuckit/fact02.html>  
<sup>43</sup> IPCC. Third Assessment Report-Executive Summary. 2001. Previous conclusions drawn in the SAR predicted a warming between 1 to 3.5 degrees Celsius.  
<sup>44</sup> Houghton et al. Climate change 1995: the science of climate change. 1995.  
<sup>45</sup> Tooley, M.J. "Sea-level response to climate." In The changing global environment. 1994. 173-189.

<sup>46</sup> Tooley, M.J. "Sea-level response to climate." In The changing global environment. 1994. 173-189.  
<sup>47</sup> Tooley, M.J. "Sea-level response to climate." In The changing global environment. 1994. 173-189.  
<sup>48</sup> UNEP "The State of the Marine Environment, Reports and Studies Number 39."  
UNEP Regional Seas and Studies #115. 1990.  
<sup>49</sup> Warrick, R. and Oerlemans, J. "Sea level rise." In Climate change: IPCC Scientific Assessment. 1990. 257-281.  
<sup>50</sup> Sugden, D. and Hulton, N. "Ice volume and climate change." In The global environmental future. 1994. 150-172.  
<sup>51</sup> "The Scientific Consensus. Villach (Austria) Conference." In The challenge of global warming. 1989.

example, warming could increase the frequency of tropical storms, which occur at sea temperatures greater than 22°C.<sup>52</sup> In general, global warming is likely to increase the frequency and severity of extreme weather events such as storms and hurricanes, heat waves and droughts.<sup>53</sup>

**Human health:** Water management systems could be affected by warming temperatures. For example, periods of severe flooding or drought would create problems with irrigation, drainage and groundwater salinization.<sup>54</sup> Scientists state that although the increase in global mean temperatures does not directly cause the spread of diseases transmitted by insects, related factors, such as deforestation, new agricultural practices, population increase, population mobility, etc. could make diseases like malaria and dengue fever more widespread.<sup>55</sup>

**Decline in overall biodiversity:** Changes in mean global temperatures and consequent alterations in the hydrologic cycle threaten species of flora and fauna.<sup>56</sup> Some species might not be able to adapt to rapid changes in climate. Coastal areas, which contain diverse and productive ecosystems such as mangrove forests, coral reefs, salt marshes and wetlands, will be affected by rising sea levels and increases in ocean temperatures.

**Implications for agriculture:** Studies suggest that as little as 1°C of global warming could produce a 100-mile shift in temperature zones.<sup>57</sup> As a consequence there will be regional shifts in agricultural productivity. Increasing evaporation rates and lesser runoff results in decreased water availability, which directly affects soil moisture and biomass productivity.<sup>58</sup> All these factors could threaten global food security.

We cannot predict with certainty the outcome of global climate change, nor are we in the capacity to unambiguously claim that climate change is driven by human activities. However, some irregular climactic manifestations have been rapid and severe, indicating that the Earth's fine balance may be easily disrupted; unsustainable use of natural resources will most likely have global repercussions.

## History of the Negotiations

With the increase of scientific evidence pointing towards the correlation between elevated greenhouse gases from anthropogenic activities and a measurable warming of the earth's lower atmosphere, political concern with regards to the effects of climate change began to grow. The World Meteorological Organization (WMO) had been conducting studies about the influence of CO<sub>2</sub> on the atmosphere since 1951<sup>59</sup>, incorporating technological advances, such as the emergence of satellite surveillance systems and approved radio communication into its research.

<sup>52</sup> Chatterjee, K. "Causes of greenhouse gas emissions." In Climate change: An integrated perspective. 1999. 143-200.

<sup>53</sup> GEF. Valuing the Global Environment. 1998.

<sup>54</sup> Jaeger, J. "Developing policies for responding to climate change." In The Challenge of global warming. 1989. 96-109.

<sup>55</sup> Reiter, P. "Bitting back." In New Scientist. 23 September, 2000. Number 2257, 41-43.

<sup>56</sup> Chatterjee, K. "Causes of greenhouse gas emissions." In Climate change: An integrated perspective. 1999. 143-200.

<sup>57</sup> Abramhamson, D.E. ed. The challenge of global warming. 1989.

<sup>58</sup> Jaeger, J. "Developing policies for responding to climate change." In The Challenge of global warming. 1989. 96-109.

<sup>59</sup> Paterson, Matthew. Global Warming and Global Politics. 1996, p.21

By the early 1970s it became clear, at least to the scientists involved, that not only were the concentrations of CO<sub>2</sub> steadily increasing, but also that the temperature of the lower atmosphere was rising. Research was directed towards the effects such a warming might involve.<sup>60</sup> Alarmed, the UN convened an array of international conferences to discuss various aspects of the potentially severe implications of different climate variations and considered the possible consequences of human induced climate change.<sup>61</sup>

In 1976 the WMO suggested developing a comprehensive model of the atmosphere to estimate any effects of CO<sub>2</sub> levels on the climate. A report published by the US National Academy of Sciences in 1979 concluded that, “there was no good reason to doubt the calculations that a doubling of CO<sub>2</sub> concentrations would lead to a warming of 1.5–4.5 degrees Celsius, and that, on present trends, such a warming could occur during the 21<sup>st</sup> century.”<sup>62</sup> In the same year, the WMO, other UN bodies, as well as the International Council of Scientific Union conducted the first World Climate Conference in Geneva, Switzerland. Its purpose was to review the current knowledge of climatic change and variability, due both to natural and anthropogenic causes, and furthermore to assess possible future climate changes and their implications for human activities.<sup>63</sup> The 400 scientists from over 50 countries concluded:

“(...) we can say with some confidence that the burning of fossil fuels, deforestation, and changes of land use have increased the amount of carbon dioxide in the atmosphere by about 15% during the last century and it is at present increasing by about 0.4% per year. It is likely that an increase will continue in the future. Carbon

dioxide plays a fundamental role in determining the temperature of the earth’s atmosphere, and it appears plausible that an increased amount of carbon dioxide in the atmosphere can contribute to a gradual warming of the lower atmosphere, especially at high latitudes. Patterns of change would be likely to affect the distribution of temperature, rainfall, and other meteorological parameters, but the details of the changes are still poorly understood”.<sup>64</sup>

They appealed to nations “to foresee and to prevent potential man-made changes in climate that might be adverse to the well-being of humanity”<sup>65</sup>. Oceanographer Roger Revelle, ecologist George Woodwell, geophysicist Gordon MacDonald, and Charles D. Keeling, founder of the Mauna Loa carbon dioxide monitoring project, reported “man is setting in motion a series of events that seem certain to cause a significant warming of world climates unless mitigation steps are taken immediately”.<sup>66</sup> For the most part, these warnings went unheeded, apart from mustering further conferences and extending the research into climate change.

In the 1980s global mean temperatures were higher than in any previous decade since scientists started taking measurements in 1860.<sup>67</sup> In view of some freak weather conditions in 1988, including extended droughts in the United States and Russia, parts of Africa, unexpectedly violent floods in other areas of the African continent, India, China, Brazil, and Bangladesh, deadly hurricanes in the Caribbean, a cyclone in New Zealand, and a typhoon in the Philippines, global warming moved rapidly up the international agenda.

<sup>64</sup> WMO. *The Declaration of the World Climate Conference*. 1979, Publication # 537

<sup>65</sup> WMO. *The Declaration of the World Climate Conference*. 1979, Publication # 537

<sup>66</sup> Public Utilities Commission of Ohio: *Global Climate Change Chronology*.  
<http://www.puc.state.oh.us/consumer/gcc/chron.html>

<sup>67</sup> Public Utilities Commission of Ohio: *Global Climate Change Chronology*.  
<http://www.puc.state.oh.us/consumer/gcc/chron.html>

The period became known as the “greenhouse decade”<sup>68</sup> and global warming became a “hot” issue on the political agenda. Although, climate change was previously discussed mainly among climate experts, the need for some framework convention dealing with preventive action on global warming became clear, and scientists started to call upon politicians to take action.

In November 1988 a World Congress on Climate and Development was held in Hamburg, Germany, and as a conclusion its participants called for the first time for CO<sub>2</sub> emissions “to be reduced by 30% by the year 2000 and 50% by 2015”.<sup>69</sup> They also argued for unilateral action from industrialized nations to embark on the “process of change and for urgent strategies for reversing reforestation and beginning afforestation programs”.<sup>70</sup> In the same year the Governing Council of the UNEP met in Nairobi, Kenya, and with the help of the WHO created an intergovernmental body to conduct ongoing studies of global warming.

This body came to be known as the Intergovernmental Panel on Climate Change (IPCC) and is the single agency dealing with climate change on an international level. Its mandate is to fully assess the state of existing scientific knowledge about the climate system and climate change, to look at the environmental, economic, and social impacts of climate change, and to develop potential response strategies.<sup>71</sup> The Panel was divided into three working groups to consider the different aspects of its mandate. Working Group I, the “Science Group”, was to conduct an “assessment of available scientific information on climate change”. Working Group II,

the “Impact Group” was to survey the “environmental and socio-economic impacts of climate change”. Finally, Working Group III, the “Responses Group”, was to develop the “formulation of response strategies”.<sup>72</sup>

Since the beginning, most attention was focused on the results of Working Group I, which was expected to deliver the most comprehensively researched and peer-reviewed information with regards to global warming thus far. Proof that climate change is a threat to be taken seriously was desperately needed to prompt political action. The IPCC First Assessment Report was published two years later and presented at the second World Climate Conference in 1990. The report shook up both policy-makers and the general public and became the basis for negotiations on the Climate Change Convention.<sup>73</sup>

During the World Climate Conference the UN General Assembly was urged to establish formal negotiations towards a Framework Convention on Climate Change (FCCC). An Intergovernmental Negotiating Committee (INC) was created and charged with the task of negotiating a FCCC, as well as associated protocols designed to counter climate change.<sup>74</sup>

In the early 1990s a series of regional conferences in developing countries took place. In 1990 Central and South American delegations convened in Sao Paolo, Brazil. Out of this meeting came the Sao Paolo Declaration, which laid the primary responsibility with respect to global warming on industrialized countries, and stated that any action taken by

<sup>68</sup> Public Utilities Commission of Ohio: *Global Climate Change Chronology*.  
<http://www.puc.state.oh.us/consumer/gcc/chron.html>

<sup>69</sup> Paterson, Matthew. *Global Warming and Global Politics*. 1996, p.35

<sup>70</sup> Paterson, Matthew. *Global Warming and Global Politics*. 1996, p.35

<sup>71</sup> UNFCCC: <http://www.unfccc.int/resource/iuckit/fact02.html>

<sup>72</sup> IPCC. *Report of the First Session of the WMO/UNEP Intergovernmental Panel on Climate Change*. 1988

<sup>73</sup> UNFCCC: <http://www.unfccc.int/resource/iuckit/fact02.html>

<sup>74</sup> Paterson, Matthew. *Global Warming and Global Politics*. 1996, p.49

developing countries depended on full financial and technical support from the North.<sup>75</sup>

The INC met for another six sessions to lay the groundwork for issues relating to binding commitments, arrangements for financial mechanisms, technical and monetary support to developing countries, as well as procedural and institutional matters.<sup>76</sup>

Negotiators from 150 countries finalized the Convention in five sessions over a period of 15 months, and the UNFCCC was presented for signature at the Earth Summit in Rio de Janeiro in 1992.<sup>77</sup> One hundred and fifty-four states, plus the EC, signed the Convention, and on March 21<sup>st</sup>, 1994, 90 days after the 50<sup>th</sup> signatory state actually ratified the document, the UNFCCC entered into force.

The ultimate objective of the Convention is to stabilize the concentration of atmospheric GHGs so as not to produce negative impacts on climate systems. This should be done within a timeframe that allows ecosystems to adapt to climate change and does not threaten sustainable food production and economic development.<sup>78</sup> In order to curtail the anthropogenic effects of GHG emissions, countries were to adopt shared but differentiated responsibilities. Industrialized countries would agree to voluntarily adopt GHG-reduction policies, contributing to climate change mitigation.

After its 11<sup>th</sup> session the INC dissolved in 1995, and the Conference of Parties (COP) became the Convention's ultimate authority. Its first session, COP-1, took place in Berlin from March 28-April 7, 1995. COP-1 determined that

the voluntary commitments contained in the UNFCCC were not being fulfilled, and even if they were, they would not be adequate to stabilize the concentrations of GHGs in the atmosphere. COP-1 thus adopts the Berlin Mandate; under Decision 1, "[t]he Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof."<sup>79</sup>

In 1995, the IPCC also published its Second Assessment Report (SAR), which soon became widely known for concluding "the balance of evidence suggests that there is a discernable human influence on global climate".<sup>80</sup> The report also confirmed the availability of "no-regrets options" and other cost-effective strategies for combating climate change.

COP-3 was the most publicized event since the Earth Summit in Rio, and some 10 000 delegates, observers, and journalists participated in the event taking place in Kyoto, Japan, in December 1997. The result of this meeting was the Kyoto Protocol, which was adopted by consensus. When it goes into force, it will legally bind industrialized countries to reduce their collective greenhouse gas emissions by at least 5% compared to a 1990 baseline by the end of the first commitment period (2008-2012).<sup>81</sup>

COP-4 was held in Buenos Aires in 1998, where the two-year "Plan of Action" was worked out with the goal of finalizing

<sup>75</sup> Paterson, Matthew. *Global Warming and Global Politics*. 1996, p.39

<sup>76</sup> UNFCCC: <http://www.unfccc.int/resource/iucikit/fact02.html>

<sup>77</sup> UNFCCC: <http://www.unfccc.int/resource/iucikit/fact02.html>

<sup>78</sup> UNFCCC, Convention on Climate Change, 1992

<sup>79</sup> FCCC/CP/1995/7/Add.1, decision 1/CP1

<sup>80</sup> IPCC: Second Assessment Report

<sup>81</sup> UNFCCC: <http://www.unfccc.int/resource/iucikit/fact02.html>

the details of the Kyoto Protocol by the year 2000. Not only were compliance issues and concrete policy measures still under discussion, but also the Protocol's mechanisms and institutional provisions.<sup>82</sup>

COP-6 was the most anticipated climate change conference since COP-4. It was held in The Hague in November 2000. This event symbolized the dateline for Parties to finalize the details for the Kyoto Protocol. However, the COP was postponed for June 2001, resulting from Parties failure to come to a consensus on issues such as: compliance; sinks in the CDM; Articles 3.3, 3.4; and supplementarity of the Kyoto mechanisms.

In February 2001, President George Bush announced that the Kyoto Protocol was "fatally flawed" and therefore the U.S. would not support it nor comply by its rules. Other countries responded to this decision with conviction on finalizing the text for the Kyoto Protocol by COP-6 part II. In June 2001, Parties met in Bonn for COP-6 part II and after two intense weeks of negotiations, Parties reached an agreement and the Buenos Aires "Plan of Action" was accomplished.

## The Kyoto Protocol

The Kyoto Protocol contains legally binding emission targets for industrialized countries (Annex I) for the period after the year 2000, and shall reinforce the UNFCCC in its goal to reverse the upward trend of greenhouse gas emissions and to prevent "dangerous anthropogenic interference with the climate system".<sup>83</sup>

Annex I countries, referred to as Annex B under the Kyoto Protocol, committed themselves to a collective 5.2% reduction of the six key greenhouse gases ( $\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{N}_2\text{O}$ , HFCs, PFCs,  $\text{SF}_6$ ). These gases are combined into a "basket" and the individual gases are being translated into  $\text{CO}_2$  equivalents, and added up to produce a single figure.<sup>84</sup>

Each Annex B country adopted a differentiated emission reduction commitment but all emission reduction targets must be met within the first commitment period 2008-2012, whereas "demonstrable progress" is to be proven by 2005. Carbon dioxide,  $\text{CH}_4$ , and  $\text{N}_2\text{O}$  are measured against a 1990 baseline; the other three gases with long atmospheric lifetimes (HFCs, PFCs, and  $\text{SF}_6$ ) can be measured against either a 1990 or 1995 baseline.

Furthermore, the Kyoto Protocol introduced three "Flexibility Mechanisms" to facilitate the greenhouse gas emission reduction process.<sup>85</sup>

Emissions Trading (ET) (Article 17): Parties included in Annex B can purchase assigned amount units (AAUs) in order to fulfill their emissions reduction commitments. All emissions trading must be supplemental to domestic action.

<sup>82</sup> UNFCCC: <http://www.unfccc.int/resource/iuckit/fact02.html>

<sup>83</sup> UNFCCC: <http://www.unfccc.int/resource/iuckit/fact02.html>

<sup>84</sup> UNFCCC: <http://www.unfccc.int/resource/iuckit/fact02.html>

<sup>85</sup> UNFCCC, The Kyoto Protocol - to the Convention on Climate Change, 1997

among countries. This observation led to the idea that it might be much more cost-effective for two countries to form a partnership in their greenhouse gas reduction efforts.<sup>86</sup> In principle, they could share the benefits of implementing an emissions reduction project in the country where costs are the lowest.<sup>87</sup> This is possible due to the following:<sup>88</sup>

**Joint Implementation (JI) (Article 6):** In order to attain their reduction commitments, JI allows Annex I countries to purchase emissions reduction units (ERUs) resulting from emissions-reducing or emissions-avoiding project activities implemented in any other Annex I Party.

**Clean Development Mechanism (CDM)** (Article 12): The CDM allows non-Annex I countries to benefit from project activities implemented by Annex I countries, which result in marketable certified emissions reductions. Annex I countries can use certified emissions reductions (CERs) acquired through project activities to comply with their reduction commitments.

The stable and delocalized nature of CO<sub>2</sub> is very well compatible with the economic characteristics of a global trading market, which has been shown to work best for uniformly mixed gases.

A large disparity of abatement costs across countries (varying between less than \$10/ton of CO<sub>2</sub> and \$100/ton of CO<sub>2</sub>) provides the economic impetus for a trading regime.

## The Evolution of the CDM

In 1991, Norway introduced the concept of 'Joint Implementation' (JI) to the Intergovernmental Negotiating Committee (INC). Though termed the same as one of the three flexibility mechanisms adopted later under of the Kyoto Protocol, Norway's proposal was much broader in definition, and constituted a rather generic term for global emissions trading. Norway had recognized that due to differences in national circumstances, the costs of greenhouse gas mitigation and abatement varied significantly

<sup>86</sup> Dixon, Robert K. (ed.). *The UNFCCC Activities Implemented Jointly (AIJ) Pilot: Experiences and Lessons Learned.* 1999, p.3

<sup>87</sup> Dixon, Robert K. (ed.). *The UNFCCC Activities Implemented Jointly (AIJ) Pilot: Experiences and Lessons Learned.* 1999, p. 407

<sup>88</sup> Climate Research Unit, University of East Anglia: *The Clean Development Mechanism.* <http://www.cru.uea.ac.uk/tiempo/floor0/recentissues28/t28a3.htm>

emission reductions should be established for developing countries at a later date, the targets could only be achieved at higher costs.<sup>91</sup>

The application of flexibility mechanisms at a global scale enhances participation and a potential for global cost savings, while achieving the stated emission targets.

The JI concept was consequently included in the UNFCCC. According to Article 4.2(a) Annex I “...[p]arties may implement such policies and measures jointly with other Parties and may assist other Parties in contributing to the achievement of the objective of the Convention[...]”. Criteria for selecting, monitoring and crediting appropriate JI projects were omitted from the original FCCC text.<sup>90</sup>

During the negotiations leading up to COP-1, representatives of developing countries began to raise questions about JI; some saw it as an attempt by industrialized countries to buy their way out of reduction commitments. The G-77 countries wondered whether credits for JI projects would be available before binding targets for domestic emissions reductions were established. Critics feared that by using JI projects to achieve low-cost greenhouse gas reduction potentials in developing countries, industrialized countries could avoid cost-intensive investments at home, and in this manner maintain their unacceptable lifestyle at home and reduce the incentive for structural change domestically. In addition, some developing countries were concerned that JI projects would exhaust the “cheap” reduction options, so that if

Costa Rica was the only developing country that embraced the concept, and declared itself available for JI projects as early as 1994 - without reservations.<sup>92</sup>

During COP-1 Costa Rica was able to negotiate G-77 and China into a compromise solution, which established the “Activities Implemented Jointly” (AIJ) pilot phase. The concept of JI was restructured, and to avoid confusion, the name of the new regime, upon a suggestion by Malaysia, changed from JI to AIJ.<sup>93</sup> In addition, a pilot phase was introduced that would promote “learning by doing” and boost cooperative international efforts to implement emissions reduction and carbon sequestration projects. During the pilot phase, which was to last until the end of the decade, no internationally fungible credits were to be awarded for projects that either achieved emissions reductions or increased the uptake of greenhouse gases by natural sinks.

Between 1995 and 2000 many OECD countries, in particular the Scandinavian countries, the Netherlands, Switzerland, and the United States actively supported the goals and principles of the AIJ. They established national AIJ offices, such as the U.S. Initiative on Joint Implementation (USIJI), and invested financial, technological and material resources

<sup>91</sup> Michaelowa, A. and M. Dutschke. *Climate Policy and Development - Flexible Instruments and Developing Countries*. 2000, p17

<sup>92</sup> Michaelowa, A. and M. Dutschke. *Climate Policy and Development - Flexible Instruments and Developing Countries*. 2000, p.16

<sup>93</sup> Dixon, Robert K. (ed.). *The UNFCCC Activities Implemented Jointly (AIJ) Pilot: Experiences and Lessons Learned*. 1999, p.408

<sup>89</sup> UNFCCC, *Convention on Climate Change*, 1992

<sup>90</sup> Dixon, Robert K. (ed.). *The UNFCCC Activities Implemented Jointly (AIJ) Pilot: Experiences and Lessons Learned*. 1999, p.9

in human and institutional capacity building activities.<sup>94</sup> Although several developing countries experimented with the concept, Costa Rica once again took the lead. This country launched nine AJ projects and introduced “certified, tradable offsets” (CTOs). Each CTO instrument represents an offset equivalent to one ton of carbon emissions reduced or sequestered.

At COP-3 (Kyoto, 1997) the AJ pilot phase was evaluated, and many governments expressed a sense of dissatisfaction with its results. Only a small number of projects had been conducted due to a lack of incentives in form of emission reduction credits. Projects were geographically concentrated in Latin America and Central and Eastern Europe, as well as sectorally, covering mainly renewable energy and forestry<sup>95</sup>, and could thus not be considered representative. Transaction costs were initially very high. Finally, the Parties could not come to a consensus about technical issues pertaining to the AJ pilot, such as the development of project baselines, performance monitoring, evaluation, verification, and certification of emissions reductions.<sup>96</sup>

Nonetheless, the concept was not abandoned, but rather transformed once again. In Kyoto, Brazil suggested the introduction of a penalty system that would subject industrialized countries to a fine if they failed to reach the proposed, strict emissions targets. Industrialized countries would have to pay fines in proportion to the degree of non-compliance. The money would then be channeled into a

“Clean Development Fund” and used to support greenhouse gas emissions mitigation projects and adaptation measures in countries most adversely affected by climate change.<sup>97</sup> Industrialized countries in general, and the United States in particular, were opposed to such a system, and strongly advocated the JI with credits in developing countries. Costa Rica, acting as a mediator, convinced the Brazilians to change their proposal to a “Clean Development Mechanism” that would still finance adaptation, but otherwise function as a market-based measure to help meet the reduction commitments.<sup>98</sup> The proposal was backed by G-77 and China, and ultimately approved by the Plenary.

The Clean Development Mechanism was included under Article 12 of the Kyoto Protocol. The CDM is a financial mechanism, which helps address the issues of global climate change through a market-based concept. Under the CDM, Annex I countries (including OECD and countries with economies in transition) will be able to use “certified emissions reductions” (CERs) from project activities in developing countries to contribute towards their compliance of national greenhouse gas emission reduction targets during the first budget period (2008-2012). Early crediting can begin as soon as 2000.

From the developing country perspective, the CDM offers the following opportunities:

<sup>94</sup> Dixon, Robert K. (ed.). *The UNFCCC Activities Implemented Jointly (AJ) Pilot: Experiences and Lessons Learned*. 1999, p.10

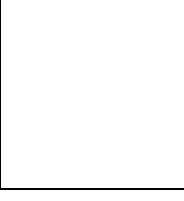
<sup>95</sup> Michael Grubb, et al. *The Kyoto Protocol: A Guide and Assessment*. RIA 1999, p.100

<sup>96</sup> Dixon, Robert K. (ed.). *The UNFCCC Activities Implemented Jointly (AJ) Pilot: Experiences and Lessons Learned*. 1999, p.11

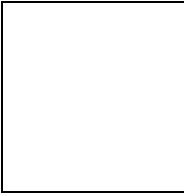
<sup>97</sup> Dixon, Robert K. (ed.), *The UNFCCC Activities Implemented Jointly (AJ) Pilot: Experiences and Lessons Learned*. 1999, p.410

<sup>98</sup> Michaelowa, A. and M. Dutschke. *Climate Policy and Development - Flexible Instruments and Developing Countries*. 2000, p.27

 It can attract capital for projects that assist in the shift to a more prosperous but less carbon-intensive economy.<sup>99</sup>

 It can help developing countries define investment priorities in projects that meet their sustainable development goals.

 It encourages and permits the active participation of both private and public sectors.

 It can be an effective tool of technology transfer if investment is channeled into projects that replace old and inefficient fossil fuel technology, or create new industries in environmentally sustainable technologies.<sup>100</sup>

The design of the CDM was not an easy task. From 1997 to 2000, a wide array of stakeholders around the world developed proposals for the guidelines and modalities of the CDM. As the various proposals were widely discussed and carefully considered, convergence of opinions began to emerge. The Sixth Conference of Parties, held in The Hague, The Netherlands, in November of 2000 marked the official start of the CDM. However, it was not until COP-6 part II that the agreement on some of the rules and regulations for the CDM were agreed on. During COP-6 part II, it was decided that the Executive Board for the CDM would be chosen by COP-7, to be held in Marrakech, Morocco in November 2001.

## Conclusion

The climate change dilemma has global ramifications, the consequences of which will more than likely be negative. However, consensus seems to be lacking in most issues relating to the impending changes in our climate and how to mitigate those changes. Some politicians and negotiators seem to demand irrefutable evidence that our carbon-dependent economies are greatly contributing to an enhanced greenhouse effect. A truly causal relationship is difficult to prove because the Earth is a dynamic and naturally changing system with a history spanning over 4.5 billion years. Human inputs are, therefore, juxtaposed over

<sup>99</sup> Swift, B. "The Least-Cost Way to Control Climate Change" in *Issues in Science and Technology Online*. <http://www.nap.edu/issues/14.3/swift.htm>

<sup>100</sup> Michael Grubb, et al. *The Kyoto Protocol: A Guide and Assessment*. RIA 1999, p.139

those that have been occurring since the birth of our planet. It is not possible to claim the scale, the nature nor the timing by which the climate is changing as a direct result of anthropogenic additions to the atmosphere. However, in light of the recent bizarre weather patterns, melting of polar ice-caps, rising mean global temperatures, etc. a business-as-usual approach seems irresponsible.

The entry into force of the Framework Convention on Climate Change and the proposed commitments and GHG mitigation efforts put forth in the Kyoto Protocol symbolize the acknowledgement of our unsustainable resource consumption. Nevertheless, the glacial pace of climate change negotiations, as Parties argue in defense of their interests, may prove to be slower than the rate at which the Earth's climate is changing.

## References

- <http://www.cru.uea.ac.uk/tiempo/floor0/recentissue28/t28a3.htm>.
- Dixon, R.K. ed. The UNFCCC Activities Implemented Jointly (AIJ) Pilot: Experiences and Lessons Learned, 1999.
- Firor, J. "Greenhouse effects and impacts on physical systems." In The challenge of global warming. 1989. 113-122.
- Flavin, C. and Tunali, O. Climate of hope: New strategies for stabilizing the world's atmosphere. Ed. Peterson, J.A. Washington, DC: Worldwatch Institute, 1996.
- From, E. and Keeling, C. "Reassessment of late 19<sup>th</sup> century atmospheric carbon dioxide variation in the air of Western Europe and the British Isles based on unpublished analysis of contemporary air masses by C.S. Callendar." Tellus 1986: 38B, 87-105.
- Grubb, M., Vrolijk, C. and Brack, D. eds. The Kyoto Protocol: A guide and assessment. London, England: Royal Institute of International Affairs, 1999.
- GEF. Valuing the Global Environment. 1998.
- Houghton, J.T. et al. eds. Climate change 1995: the science of climate change. Cambridge; New York: Cambridge University Press, 1996.
- IPCC. Report of the first session of the WMO / UNEP Intergovernmental Panel on Climate Change. 1998.
- Jaeger, J. "Developing policies for responding to climate change." In The challenge of global warming. 1989. 96-109.
- Jansen, D. "The climate system." In Climate change: An integrated perspective. 1999. 11-50.
- Karl, T.R., Jones, P.D., Knight, R.W., White, O.R., Mende, W., Beer, J. and Thomson, D.J. "Testing for bias in the climate record." In Science. March 29, 1996: 271, 1879-1883.
- "The Clean Development Mechanism". Climate Research Unit, University of East Anglia. August 14, 2000.

- Keeling, C. "Atmospheric CO<sub>2</sub> concentration, Mauna Loa Observatory, Hawaii, 1958-1983." U.S. Department of Energy Report NDP-001. 1984. Carbon Dioxide Information Center, Oak Ridge, Tennessee.
- MacDonald, G. "Scientific basis for the greenhouse effect." In The challenge of global warming. 1989. 123-145.
- Martens, P. and Rotmans, J. eds. Climate change: An integrated perspective. Dordrecht; Boston: Kluwer Academic Publishers, 1999.
- Michaelowa, A. and Dutsché, M. Climate policy and development: Flexible instruments and developing countries.
- NAS. "Carbon dioxide and climate: A scientific assessment". 1979.
- Paterson, M. "Global warming and global politics". 1996.
- Public Utilities Commission of Ohio. "Global climate change chronology". July 25, 2000.  
<http://www.puc.state.oh.us/consumer/gcc/chron.html>
- Reiter, P. "Biting back." In New Scientist. 23 September, 2000: Number 2257, 41-43.
- Roberts, N. "The global environmental future." In The changing global environment. 1994. 1-48.
- Roberts, N. ed. The changing global environment. Oxford, UK; Cambridge, MA: Blackwell, 1994.
- Schneider, S.H. ed. Laboratory earth: The planetary gamble we can't afford to lose. New York: BasicBooks, 1997.
- "The Scientific Consensus. Villach (Austria) Conference." In The challenge of global warming. 1989.
- Street-Perrott, F.A. and Roberts, N. "Past climates and future greenhouse warming." In The changing global environment. 1994. 48-67.
- Sugden, D. and Hulton, N. "Ice volume and climate change." In The global environmental future. 1994. 150-172.
- Swift, B. "The least-cost way to control climate change". Issues in Science and Technology Online. August 20, 2000.  
<http://www.nap.edu/issues/14.3/swift.htm>
- Tooley, M.J. "Sea-level response to climate." In The changing global environment. 1994. 173-189.
- UNEP "The State of the Marine Environment, Reports and Studies Number 39." UNEP Regional Seas and Studies #115. 1990.
- UNFCCC. United Nations Framework Convention on Climate Change. 1992.
- UNFCCC. The Kyoto Protocol to the Convention on Climate Change. Annex A. 1997.
- UNFCCC. Climate change information sheet. August 16, 2000.  
<http://www.unfccc.int/resource/iuckit/fact02.html>
- Warrick, R. and Oerlemans, J. "Sea level rise." In Climate change: IPCC Scientific Assessment. 1990. 257-281.
- Woodwell, G.M. "Biotic causes and effects of the disruption of the global carbon cycle." In The challenge of global warming. 1989. 71-81.
- World Meteorological Organization. "The declaration of the World Climate Conference". Publication #537, 1979.

# Chapter 2: The Operation of the CDM

Written: Christiana Figueres  
Co-authored by: Mary Gowan

This chapter is an overview of the structure and operation of the CDM at the international level as decided by the international negotiation process. Chapters 3, 4, and 5 refer to the operation of the CDM at the national level, as may be conceived within each of the participating developing countries

## Introduction

The Clean Development Mechanism (CDM) was established under Article 12 of the Kyoto Protocol adopted by the Third Conference of the Parties to the Framework Convention on Climate Change on December 11, 1997. The CDM was defined with the purpose of “assisting Parties not included in Annex I to the Convention in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments”.<sup>101</sup>

The CDM is a cost effective means of global climate change mitigation through a market-based concept, as well as a means of promoting sustainable development in developing countries. It will offer flexibility to industrialized country private sector entities which are unable to cost effectively meet emission reduction targets domestically within a given commitment period while channelling funds from those entities toward projects in developing countries which offer the service of global decarbonization<sup>102</sup>.

## The CDM and Sustainable Development

From the perspective of developing countries the success of the CDM rests on its contribution to national sustainable development goals, and there is indeed great potential for such benefits. Article 12 states that emission reductions will have to prove real, measurable and long-term benefits for climate change mitigation and that these reductions in emissions must be additional to any that would have occurred had the project not been carried out.

The additional funding funneled through the CDM will assist developing countries in reaching some of their economic, social, environmental, and sustainable development objectives, such as cleaner air and water, soil restoration and conservation, and in many cases, reduced dependence on imported fossil fuels. Social benefits such as rural development, employment, and poverty alleviation are also expected to occur. Besides catalyzing green investment priorities in developing countries, the CDM offers an opportunity to make progress simultaneously on climate, development, and local environmental issues. For developing countries that might otherwise be preoccupied with immediate economic and environmental needs, the

<sup>101</sup> Kyoto Protocol UNFCCC/CP/1997/L.7/add.1 December 10, 1997 Kyoto, Japan.

<sup>102</sup> Although the term refers to the removal of carbon dioxide from the atmosphere, the concept includes the removal of all greenhouse gases.

prospect of such benefits should provide a strong incentive to participate in the CDM.

The determination of whether projects help host countries achieve sustainable development lies with the host country. There is no operational or “objective” method to determine whether a project contributes to a country’s sustainable development. Several attempts were made to find indicators for sustainable development<sup>103</sup>, but general acceptance of any resulting indicators had obvious political ramifications and consensus was not reached. It shall be the host country’s prerogative, therefore, to confirm whether a CDM project activity assists in achieving sustainable development<sup>104</sup>.

In the absence of internationally agreed sustainability criteria, it is critically important that each host country develop national sustainability measures that are transparent and widely disseminated. The responsibility is clearly on the shoulders of each host country to ensure that projects with no direct benefits or with negative benefits for the host country do not qualify for the CDM, even if they result in net GHG emission reductions.

## Criteria for Participation

In order to participate in the CDM, there are certain eligibility criteria that countries must meet. All Parties must meet three basic requirements: the willingness to participate in the CDM as participation is voluntary, ratification of the Kyoto Protocol, and the establishment of a national authority for CDM purposes. In addition, industrialized countries must

meet several further stipulations: establishment of the assigned amount under Article 3 of the Protocol, of a national system for the estimation of greenhouse gases, and of a national registry. The Secretariat of the UNFCCC has been charged with maintaining a publicly accessible list of Parties that do not meet the participation requirements.

Assuming that countries comply with these requirements, projects starting as of the year 2000 may be eligible for the CDM. The CDM projects undertaken in developing countries will result in “certified emission reductions” (CERs). The industrialized countries can then use these CERs to comply with their quantified emission limitation and reduction commitments under the Protocol. Although the first commitment period will not be until 2008 to 2012, all CERs obtained between the years 2000 and 2008 can be banked towards that commitment period.

## Governance and share of proceeds

As defined in the Protocol, the CDM will be administered by two bodies: the COP/MOP and the Executive Board.

**COP/MOP:** The Conference of the Parties, serving as the Meeting of the Parties is the supreme body of the CDM, and is constituted by those countries that have ratified the Protocol. The COP/MOP will provide guidance to the Executive Board and elaborate modalities and procedures with the objective of ensuring transparency, efficiency and accountability. The COP/MOP will also review the regional and sub regional distribution of designated operational entities, in order to ensure an equitable distribution.

<sup>103</sup> Hassing, Paul and Matthew Mendis, An International Framework for CDM Transactions. Unpublished, March, 1999.

<sup>104</sup> FCCC/Draft decision /-CP.6 (Article 12)

**Executive Board:** The Executive Board will supervise the CDM and will be fully accountable to the COP/MOP. It will be

responsible for the accreditation of operational entities, define modalities and procedures for the CDM, approve new methodologies and guidelines related to baselines, monitoring plans and project boundaries, and maintain the CDM registry.

The Executive Board shall comprise ten members from Parties to the Kyoto Protocol, as follows: one member from each of the five United Nations regional groups; two other members from the Parties included in Annex I, two other members from the Parties not included in Annex I and one representative of the small island developing States, taking into account the current practice in the Bureau of the Conference of the Parties.<sup>105</sup>

Members shall be nominated by their respective geographic constituencies, shall have appropriate technical and policy expertise, and shall have no participation in any aspect of a CDM project activity in order to avoid conflict of interests. **Members of the Board are to be elected at COP7, in Marrakech.**

The Protocol authorizes two fees in the CDM. The first is the administrative fee to cover the operational cost of the CDM. This will be charged as a share of the proceeds at a level as yet undefined. The second is the fee to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change in meeting the costs of adaptation. This fee shall be charged at the level of two percent of the certified emissions reductions issued for each CDM project.<sup>106</sup> An exception is made for projects in least developed country Parties, which are exempt from this fee.

## The CDM Project Cycle

All CDM projects must have a net GHG reduction as one of their benefits. This decarbonization of the atmosphere can be attained either through the reduction or avoidance of carbon dioxide emissions, as in the case of energy efficiency, renewable energy generation, or through the sequestering of carbon, as in the case of improved land uses and soil recovery.

Decarbonization projects are comprised of two parallel flows. The first flow (the "traditional flow") is typical of any traditional investment in an electricity generation or forestry project. The project goes through the well known stages of pre-feasibility, feasibility, development, and if found viable, financing and construction in the case of power generation, or planting in the case of forestry. The products are electricity or wood. The traditional flow must have a manageable level of risk and an acceptable internal rate of return, as the project is typically financed by multilateral banks, private commercial banks, specialized funds, or a combination thereof, and undertaken by an investor with cost recovery and profit in mind.

The second flow is the "carbon flow". The products of this flow are carbon dioxide avoided or reduced in the case of energy projects, or tons of carbon fixed in the case of land use projects.<sup>107</sup> Through the CDM these products can be purchased by greenhouse gas emitting sources, such as thermal power generation companies in industrialized

<sup>105</sup> One metric ton of carbon is equivalent to 3.67 metric tons of carbon dioxide. In order to make the argument more transparent we shall call both these products "carbon".

<sup>106</sup> FCCC/CP/2001/L.7, para 5, page 9  
<sup>107</sup> FCCC/CP/2001/L.7, para 10, page 8

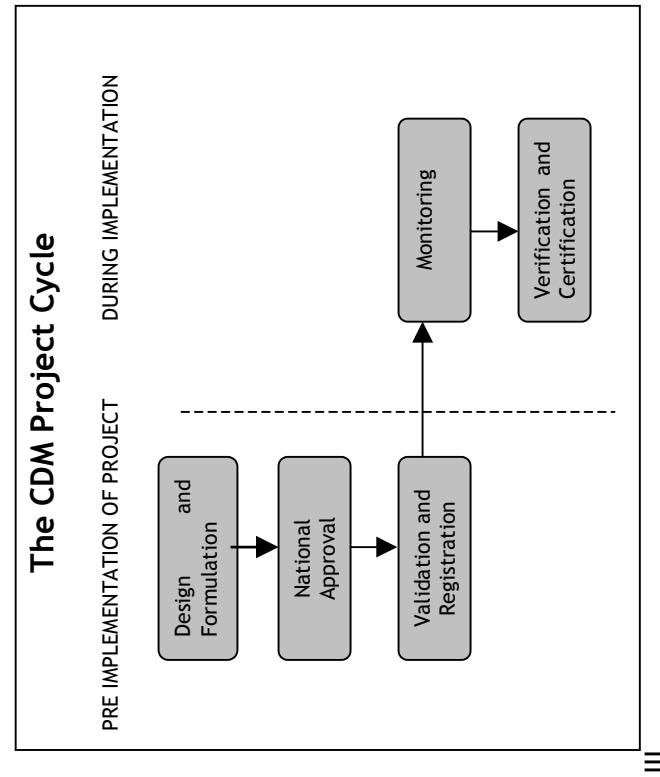
countries. The market price of carbon will be in between the minimum seller price, which must cover the direct costs of the carbon "reduction" (all the below stages of the carbon flow) and the transaction costs, and the maximum purchaser price, which cannot exceed the cost of domestic reduction measures in the industrialized countries. The sale of this product can significantly increase the internal rate of return (IRR) of the entire project. In the case of projects with a healthy IRR on the traditional flow, the carbon is an incentive to implement a more greenhouse gas efficient project. In the case of projects that are not quite commercial, the decarbonization sale could make them viable.

However, in order for this carbon component to acquire value in the international carbon market, it must be submitted to a project cycle process designed specifically to measure and audit the carbon component of the project. This project cycle has five fundamental stages: design and formulation, national approval, validation/registration, monitoring, and verification/certification. The first three are performed previous to the implementation of the project. The last two are performed during the lifetime of the project.

### *Project Design and Formulation*

The first and most important step in the CDM project cycle is the identification and formulation of potential CDM projects. Project formulation must follow the format established by the COP. The Project Design Document includes a description of the project, a presentation of the baseline

calculation, an explanation of how the project meets the additionality requirements, an environmental impact assessment, stakeholder comments, and a monitoring plan. The internationally required format is included in Appendix III.



From the project developer's point of view, this Project Design Document should be elaborated at the same time as the feasibility study of the project, in order to facilitate incorporating the value of the CERs into the financial analysis of the project.

### *National Approval*

All countries wishing to participate in the CDM must first develop a national authority to evaluate and approve the projects. Although the international process has given

general guidelines on baselines and additionality, each developing country has the responsibility to determine the national criteria for project approval. These criteria should comply with the requirements defined by the COP/MOP, but should also define the national requisites and priorities for sustainable development. It is important that the evaluation and approval process be transparent and efficient. The CDM project cycle represents compounded transaction costs, and should not be unnecessarily burdened with costs at the national evaluation level.

This Guide for the Establishment of National CDM Authorities is intended precisely as a tool for the development of this national approval entity in developing countries. The functions of the national CDM authority are presented in detail in Chapter 5.

### ***Validation and Registration***

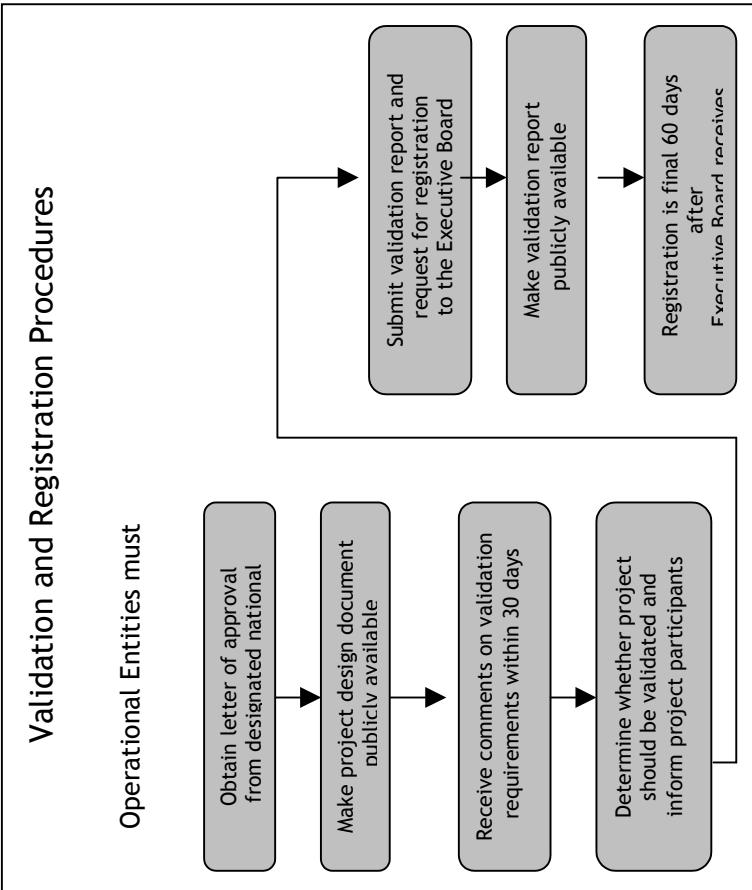
Validation is the process of independent evaluation of a project activity on the part of a designated operational entity. Registration is the formal acceptance by the Executive Board of a validated project as a CDM project activity.<sup>108</sup> Projects will be validated by the operational entities according to the internationally defined procedures.

Operational entities will be accredited by the Executive Board and designated by the COP/MOP. These operational entities will typically be current private companies such as auditing and accounting firms, consulting and law firms. Many companies aspiring to be accredited have already made public their intent of entering this new line of business. It is however critical to remember that operational entities can perform only one function in the cycle of any given CDM project: either validation/registration, or verification and

### ***Monitoring***

Monitoring is the systematic surveillance of the project's performance by measuring and recording performance-related indicators. A monitoring protocol should provide confidence that the emission reductions and other project objectives are being achieved and should be able to monitor the risks inherent to baseline and project emissions. The monitoring plan should clearly identify frequency of,

certification. Participation in both auditing steps would be a clear conflict of interests and is not allowed.



<sup>108</sup> UNFCCC, Draft Decision -/CP.6 (Article 12), page 27

responsibility and authority for registration, monitoring and measurement activities and should determine the verification schedule for claimed emissions reductions. The monitoring protocol should give enough information to satisfy future verifiers' needs.

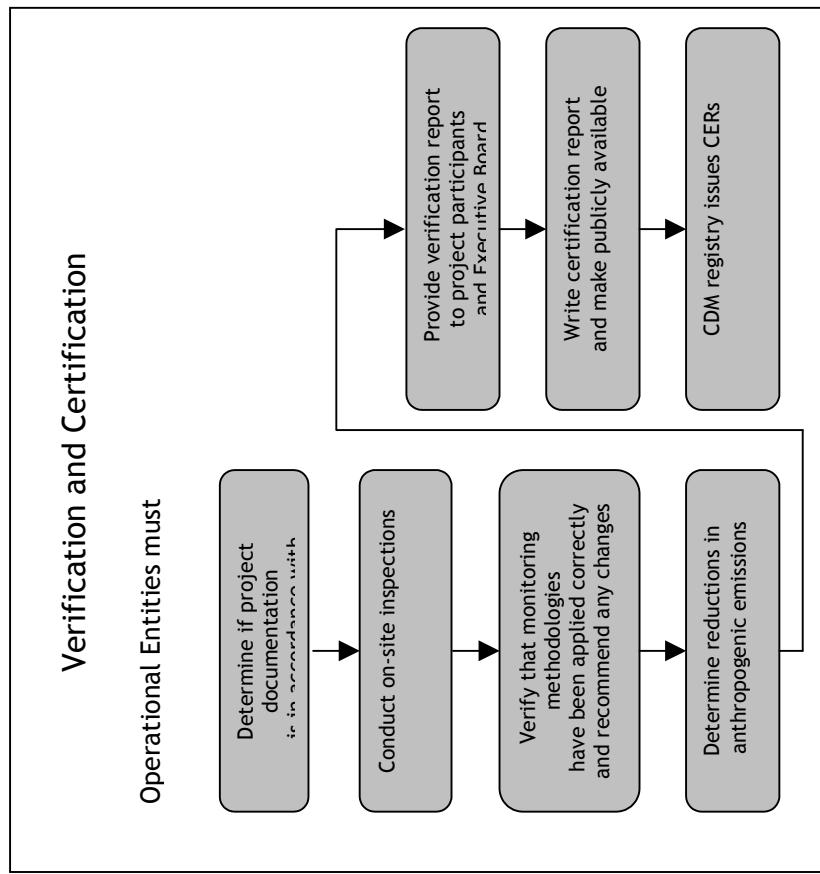
The basic three components of a monitoring protocol are as follows:

- A methodology to demonstrate whether the project contributes to achieving emissions reductions and sustainable development in the host country, as described in the validation document, and, if it deviates from this description, how it impacts on project objectives.
- Management systems: reporting considerations; physical infrastructure, for example, relevant monitoring equipment and management tools; flow rate monitors, gauges, meters and electronic information storage and retrieval mediums; managerial infrastructure, for example, operational; allocation of responsibilities, maintenance protocols, emergency preparedness and corrective actions etc.
- Training requirements to support the proposed monitoring activities.

The monitoring protocol can be established either internally by the project developer, or externally by a specialized agent. Once defined however, the protocol can be executed by the project developer, and should be an integral part of the project's tracking system. The monitoring plan constitutes the basis of future verification.

## ***Verification and Certification***

Verification is the independent, periodic review and ex-post determination by the operational entity of the monitored reductions in emissions. The independent verifier must make sure that the CERs have resulted according to the guidelines and conditions agreed upon in the initial validation of the CDM project. Certification is the written assurance by the operational entity that, during a specified time period, a project activity achieved the reductions as verified.



The certification report constitutes a request for issuance of CERs. The issuance is performed by the Executive Board, and is considered final 15 days after the date of receipt of the request for issuance. Upon being instructed by the Executive Board to issue CERs, the CDM registry forwards the quantity of CERs corresponding to the share of proceeds for both the administrative and adaptation costs to the appropriate accounts in the CDM registry, and the remaining CERs to the registry of the project participants. The transaction is then complete.

## Conclusion

The international structure and operation of the CDM has been long in the making. It is undeniably cumbersome, particularly when compared to the more streamlined procedures for both joint implementation and especially emissions trading. However, the operational guidelines of the CDM are the result of protracted and contentious negotiations, which sought to balance the political implications of international emission reductions which are clearly used to offset or delay domestic reductions, with the environmental benefit of reducing the cost of global reductions.

As this book goes to publication the United States administration has made clear its intent of not ratifying the Kyoto Protocol in the near future. Despite the announcement, or maybe because of it, all other countries agreed to the above rules and procedures for the CDM at the second session of COP6, rules which must be officially adopted at COP7.

Given these agreements and barring unforeseen circumstances, it is now likely that the Protocol could be

ratified by enough countries in 2002 to allow it to enter into force. Should the US continue to hold itself out of the Protocol, the global climate effort might be built on two parallel regimes. The US could create a national voluntary regime, under which some individual states might adopt regulatory emission limits. The other industrialized countries would participate in what we might call the "European Kyoto" regime according to the recent Bonn Agreement, and be regulated in their use of the flexibility mechanisms including the CDM. Developing countries would still be suppliers of emission reductions, providing this service either to the Kyoto-bound countries through the CDM, or to the US voluntary regime. However, the withdrawal of the US from the Protocol will severely reduce the demand for international reductions.<sup>109</sup>

Some have argued that the Protocol without the US is reduced to a 'simple' institutional building exercise. We would argue that the institutional building exercise is not simple. The complexity of operating the CDM as described in this chapter is not to be underestimated. Presuming that the CDM is a long-term instrument of the climate regime, the global investment made now is fundamental to the future success of the regime. A mechanism such as the CDM has never been attempted. It is clearly a case where we can only learn by doing, and where every mistake is only a valuable lesson learned.

<sup>109</sup> The International Energy Agency in Paris has estimated that the net demand could oscillate from - 205 million tons of carbon (oversupply) with maximum hot air in the system, to 2,305 million tons of carbon, according to the economic model used. Pershing, 2001.

## References

- Figueres, C., Hambleton, A. and Chatterjee, K. "Do AIJ Projects Support Sustainable Development Goals of the Host Country?". Chapter IX of Lessons Learned from AIJ. Edited by Robert Dixon. Kluwer Academic Publishers, November 1999.
- Figueres, C. and Figueres, J.M. "Decarbonization of the Economy". Our Planet, Volume II, Number I, 2000.
- Haites, E. and Yamin, F., "The Clean Development Mechanism: Proposal for its Operation and Governance", draft paper for comment, November 1998.
- Hassing, P. and Mendis, M.S., "Sustainable Development and GHG Reduction", Issues and Options; The Clean Development Mechanism, United Nations Development Programme, New York, 1998.
- Hassing, P. and Mendis, M.S., "An International Framework for CDM Transactions". Unpublished, March 1999.
- Pershing, Jonathan. "*International GHG emission trading: what would it mean without the United States?*". International Energy Agency, Paris. Internal discussion document. May 2001
- United Nations Framework Convention on Climate Change, Draft Decision - /CP.6 Mechanisms

# Chapter 3: Evolution of National CDM Authorities

Written by: Christiana Figueres and Helena Olivas  
Center for Sustainable Development in the Americas

## Introduction

During the years leading up to the Sixth Conference of the Parties in November 2000, national AIJ entities were created in several developing countries, mostly in Latin America. The institutional effort was undertaken on a voluntary basis, and was considered to be beneficial to that country's participation in the international emissions reduction market.

This chapter will focus on the chronology of the development of national AIJ/CDM entities throughout Latin America. Some countries have already achieved the implementation of their national programs, whereas others are still in the process. Nonetheless, the Latin American experience in AIJ/CDM institutional development is exemplary and will contribute to future worldwide institutional progress. This chapter traces the history from the Costa Rican experience starting in 1994, to efforts of Ecuador and Paraguay in 2000. Furthermore, it compares and contrasts the various national entities in the region, and identifies the major challenges of CDM institutional development.

## Historical Evolution of Latin American AIJ/CDM Entities

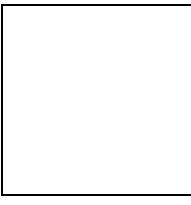
### COSTA RICA

Just as Costa Rica was the one developing country, which was most willing to experiment with AIJ projects in the early stages, it was also the first developing country to pioneer the concept of a national AIJ/CDM entity. Already in 1994, Costa Rica legally consolidated the Oficina Costarricense de Implementación Conjunta (OCIC) by Executive Decree. The OCIC was defined within the framework of the UNFCCC policies and criteria for the preparation, evaluation, and approval of AIJ projects.

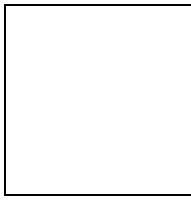
OCIC was jump-started by two recently graduated Harvard Business School graduates, Stephen Petricone and Hannah Riley, who were brought to Costa Rica by the Minister of the Environment with the task of developing a national AIJ entity. On behalf of the Ministry, these two individuals arduously worked over a period of twelve months to set the basis for an inclusive, effective and transparent entity.

As knowledge about AIJ grew within the country, the NGO community as well as the private sector became interested in playing a role. In mid-1995 an agreement was signed among the public, private, and NGO sectors, each agreeing to contribute to the continued development of the national entity. This cooperative agreement gave birth to the Costa Rican Office on Joint Implementation (OCIC). It was signed by the Ministry of Environment and Energy (MINAE), the Coalition of Development Initiatives (CINDE), a private sector entity specialized in investment promotion, the Foundation for the Development of the Central Volcanic Mountain Range

(FUNDECOR), a non-governmental organization with recognized experience in forestry, and the Costa Rican Association of Energy Producers (ACOPE), representing the private generators of renewable electricity.<sup>110</sup> Each party agreed to contribute toward the operation of OCIC, either in kind or financially:



**Ministry of Energy and Environment:**  
This Ministry and other agencies under its supervision, contributed office space and logistical support during the initial stages of the JI Program. It also leveraged funding from multilateral sources to pay for highly qualified consultants and co-sponsored local and international workshops. The Ministry currently pays the salary of an energy and forestry expert, and provides legal counsel through the Ministry's legal department.



**FUNDECOR:** A non-governmental organization created with USAID support to protect biodiversity in Costa Rica. It provided technical support and expertise during the infancy of the office, and contributed by organizing workshops and promoting Costa Rican JI opportunities abroad. FUNDECOR currently funds the services of the OCIC Executive Director.

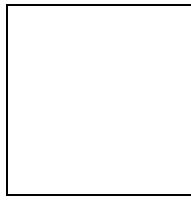
---

<sup>110</sup> Reporte Nacional sobre Actividades Conjuntas Durante la Fase Piloto, Republica de Costa Rica, Febrero, 1999.

**CINDE:** A non-profit foundation dedicated to the promotion of Costa Rican exports and investment opportunities. It began by co-sponsoring conferences and offering promotional support, and later increased its support significantly, contributing financial resources, as well as the physical facilities which now house the OCIC offices. CINDE also provides marketing expertise and contacts abroad.

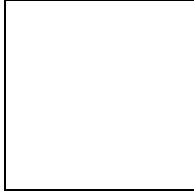


**ACOPE:** The association of private sector of renewable energy generation. This association is a strategic partner of the OCIC and contributes in the development of energy projects at a technical and a political level. ACOPE works hand in hand with OCIC on the development of the OCIC's energy project portfolio.



**Other private sector firms and organizations:** A number of companies have contributed to the efforts of the OCIC, most notably by co-sponsoring conferences or other training or promotional events. For example, during the June 1995 international JI conference in Costa Rica, a number of private firms and industry chambers contributed financial resources toward

meals and receptions, and staff to aid with logistics. As another example of private-sector support, the Forestry Chamber helped organize a local workshop regarding possible JI opportunities in the Costa Rican forestry sector.



**Other NGOs, scientific and academic organizations:** In addition to sponsoring specific projects, a number of NGOs, scientific and academic institutions, have provided expertise and knowledge that has proven useful in the analysis of Costa Rica's national development priorities, as well as in the evaluation of specific projects. One example that clearly stands out is the Meteorological Institute, which developed Costa Rica's national inventory of GHG sinks and sources in coordination with UNEP.

In 1996, the OCIC was elevated to the rank of "maximum concentration office" of the Ministry of Environment and Energy. This decision allowed the program to have technical and administrative autonomy, as well as guaranteed all participating sectors a voice in policy development.

Since its inception, the OCIC has approved a total of nine AJU projects: four in the renewable energy sector, and four in the conservation, reforestation and/or regeneration sector, and one in the agricultural sector.

In a time when most countries were still trying to understand the more basic concepts of climate change, OCIC forged ahead with both effective institutional developments as well as innovative financial instruments. The CTO was defined as

a certification of specific number of units of GHGs, expressed in carbon equivalent units, which have been reduced or sequestered by AJU actions, in which all project implementation phases have been completed.”<sup>111</sup> These have been reported to the UNFCCC, are pre-certified by an independent third party, and are fully transferable. The Government of Costa Rica guarantees each CTO an “X” number of years, according to the lifetime of the project. During the guarantee period, any CTO that is declared invalid as a result of the monitoring and/or external verification would be replaced.

OCIC’s exemplary success can be credited to several contributing factors: a strong and visionary political leadership at the highest level, a solid understanding of issues, clarity of technical implementation and a daring approach at the international level. Most uniquely, the Costa Rican example serves to demonstrate that cooperation among different sectors of a country’s institutional structure can be accomplished. Public, private and NGO sectors were able to find common ground for the implementation of a common goal. This coordination allowed the OCIC to develop rapidly, and become self-sustainable.

## GUATEMALA

In 1996, the Center for Sustainable Development in the Americas (CSDA) studied the experience of Costa Rica with the purpose of making available to other countries some of the lessons learned. In May of that year, at the request of the government of Guatemala and funded by USAID, CSDA organized the first ever workshop on AJU institutional

---

<sup>111</sup> Reporte Nacional sobre Actividades Conjuntas Durante la Fase Piloto, Republica de Costa Rica, Febrero, 1999.

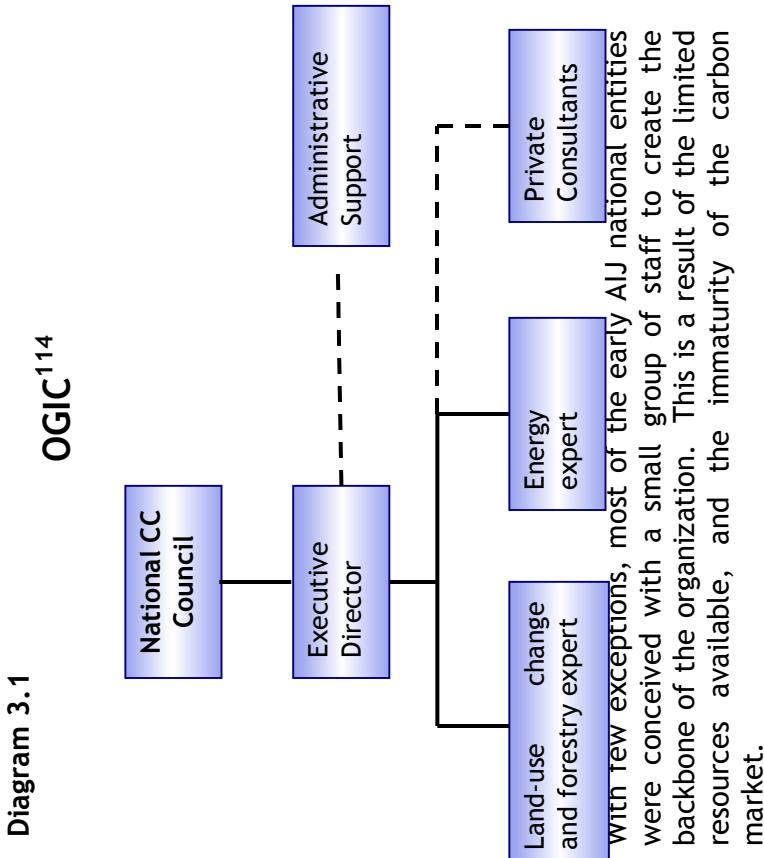
issues.<sup>112</sup> Representatives from governmental institutions, environmental organizations, education centers, and the private sector attended the workshop. The weeklong session set the basis for the creation of a national AIJ entity by defining project evaluation criteria, a clear approval procedure, a feasible structure and a legal framework. In addition, consensus was reached in designating FUNDESA as the site for the new entity.

In June of that year the Government Decree creating the Guatemalan Office of Joint Implementation (OGIC) was drafted and submitted for review and approval. The draft lead to a prolonged competition for leadership among the Ministries of: Energy, Agriculture and the Environment. All three governmental institutions vied for the authority of approving projects. After heated discussions, it was agreed that each Ministry would participate in the technical review of projects belonging to the respective sector recommending their approval or denial. However, the final signature for host country approval would come from the Minister of the Environment. Under this agreement, the government decree was finally approved in February of 1997, and published in June of the same year.

The Board of OGIC has representatives from: the Ministry of Agriculture and Livestock, the Ministry of Energy and Mines, the National Environment Council (CONAMA), the universities, the Association of Volunteer Environmental Organizations (ASOREMA), and the private sector Development Foundation of Guatemala (FUNDESA).<sup>113</sup> OGIC is granted a technical nature, being given the responsibility of

promoting, evaluating and approving AIJ projects. However, the overall national climate change policy is entrusted to the National Climate Change Council, formed in July 1997. The Council is formed by the same entities as the Board of OGIC, with the inclusion of the organization's Executive Director.

Diagram 3.1. shows the structure of the national authority, which reflects the small number of staff members.



<sup>112</sup> <http://www.fundesa.guatemala.org/OGIC/ji.html>  
<sup>113</sup> Dopazo, Eduardo. Unpublished document: "Oficina Guatmalteca de Implementación Conjunta, Actividades Realizadas 1996-1998", August 2, 2000.

<sup>114</sup> Power point presentation of OGIC, Sept, 1997.

Under the leadership of Eduardo Dopazo, the first director of OGIC, in the year 2000 the Office had approved five projects (three renewable energy projects, one in the land use change sector, and one in the agricultural sector)<sup>115</sup>. The USUJI program has approved the three energy sector projects. OGIC was also actively involved in capacity building on AIJ/CDM issues both nationally and internationally.

In contrast to its Costa Rican counterpart, the government of Guatemala delegated the responsibility of implementing OGIC to the private sector, represented by FUNDESA. Although directly accountable to the intersectoral Board of OGIC, and ultimately to the Ministry of the Environment, OGIC continues to function as a private sector entity. During the first four years of operation FUNDESA housed and financed OGIC. OGIC also received funding support from private entities, USAID and the World Bank.

Enriched by the contrasting experiences of Costa Rica and Guatemala, in 1996 CSDA published Implementing JI/AIJ: A Guide for Establishing Joint Implementation Programs<sup>116</sup>, again with the financial support of USAID. The Guide identified the range of legal, structural, operational and financial underpinnings in the creation of national AIJ entities. The Guide was published in English and Spanish, and was widely distributed around the world. (The current Guide for Establishing National CDM Authorities is an effort to update the original manuscript with the latest international decisions on CDM.)

During the following years CSDA selected experienced people from both the Costa Rican and the Guatemalan offices to convey lessons learned at home, in other countries in the region. Using the Guide as a training tool, CSDA organized an institutional building workshop in Bolivia in December 1996. As a result, Bolivia established a section within the Ministry of Sustainable Development, dedicated exclusively to climate change issues, including AIJ.

## BOLIVIA

Aware that there is no "cookie cutter" approach, and that each country would have to decide on the particular form of institutional development, between 1997 and 1999, CSDA implemented a series of individual workshops in Chile, El Salvador, Honduras, Argentina, Nicaragua, Colombia, and Panama. As expected, the development of the different entities varied from country to country in terms of: legal nature, timing of implementation, structure, staff make-up and inclusion of the various sectors. Some countries in fact decided not to proceed with the creation of a dedicated entity, but rather to incorporate the functions into an existing government agency.

## EL SALVADOR

In 1996, the Fundacion Salvadorena para el Desarrollo Economico y Social (FUSADES) promoted the pilot phase for activities implemented jointly, with the purpose of elaborating greenhouse gas emission reduction projects in the different sectors. The Comision para el Desarrollo Sostenible (CODES) would then submit these projects to the U.S. Initiative on Joint Implementation (USUJI). In May of 1997 the Ministry of Environment and Natural Resources (MARN) of El Salvador was established and took the

<sup>115</sup> National Report on Activities Implemented Jointly during the Pilot Phase. Republic of Guatemala, July 1999.  
<sup>116</sup> Figueiras et al, Implementing JI/AIJ: A Guide for Establishing Joint Implementation Programs, Washington, DC, November 1996.

leadership on AIJ issues. This new leadership and the ratification of the Kyoto Protocol in 1998, lead to activities for promoting the Clean Development Mechanism (CDM) nationally.

Initially, the Ministry of Environment was eager to take the lead for implementing a national program for the CDM, however, the development for such entity stalled. Later, discussions were initiated between the MARN and the private sector to encourage the private sector to take on the initiative. However, the private sector felt the initiative of establishing a self-sustainable CDM entity, through the sale of Certified Emission Reductions (CERs) was too risky, since the carbon market was yet to be developed.

Finally, in 2000 within the MARN, the government established two departments, one for climate change and one for sustainable development. From these stemmed two divisions: the CDM division and the climate change division. The later was responsible for addressing adaptation issues and the compromises established under the UNFCCC. Under the CDM division the CDM program was established, known as Oficina del Salvador de Desarrollo Limpio (OSDEL).<sup>117</sup>

During the development of the different departments and divisions of the MARN, in 2000 the OSDEL received US\$1 approval for the first ever climate-related industrial re-conversion project in the cement industry sector. OSDEL and the climate change division of the MARN have developed different studies to determine the best strategies to develop mitigation carbon projects in the country, developed national criteria and guidelines for CDM projects, and has taken on numerous activities for research and implementation of climate change activities.

## HONDURAS

In 1997, Decree 007-97 provided the legal framework for the Oficina de Implementación Conjunta de Honduras (OICH). However, it was not until March 1998 that the Norwegian-financed Project for the Sustainable Promotion of Natural Resources (PAGS) hired a national expert, Sergio Zelaya, to design the entity and search for funding.

The proposed design<sup>118</sup> relied heavily on primary sources from the Costa Rican program, and was informed by CSDA's previously published Guide. Once the design was complete, OICH had to embark on a prolonged search for funding, which was finally provided by the Fund for Environmental Management Honduras-Canada. This funding allowed the OICH to become operational in November 1999.

OICH is a non-governmental organization that works closely with the public and private sector to promote carbon mitigation activities. It reports directly to the Ministry of Natural Resources and the Environment. Since its establishment, the OICH has contributed to the development of a national market for CERs; facilitate the design and strategies of climate change; obtain funds for the implementation of eligible projects, and develop procedures for the certification of CERs. Honduras ratified the Kyoto Protocol in May 2000.

## PANAMA

<sup>117</sup> [http://www.marn.gob.sv/des\\_lim.htm](http://www.marn.gob.sv/des_lim.htm)

<sup>118</sup> Propuesta de Organización. Programación y Financiamiento de la Oficina de Implementación Conjunta de Honduras, para la Reconstrucción Nacional.” January 1999.

In 1996 the Government of Panama requested support for the development of a national AIJ entity. In October 1997 a scoping mission funded by the GEF was implemented by CSDA and the World Bank to determine and analyze the progress of the institutionalization of an AIJ/CDM program. The mission advised on the steps to be taken for the implementation of a national program, the purpose it would serve, the timing of its development, and its design.

In April of 1998, the ANAM (National Authority for the Environment) hired CSDA to carry out the first series of capacity building workshops on the carbon market. These workshops lead to the creation of an entity that would allow Panama to participate in the Clean Development Mechanism (CDM) and determine the priorities of climate change related working areas. As requested by the ANAM and private sector representatives interested in the CDM, CSDA held a second workshop in November of the same year to determine the guidelines for establishing the national CDM authority, which would be responsible for developing carbon market activities.

On June 1, 1999, FUPASA (Panamanian Foundation for Environmental Services) was created by governmental decree. FUPASA was made responsible for actively promoting environmentally sound GHG-reducing investment opportunities to potential investors in industrialized countries. It was to evaluate, approve and market climate change mitigation projects. FUPASA was created with the possibility of undertaking other environmental services in the future.

Currently, ANAM provides FUPASA with one regular employee, the technical coordinator. Six positions are envisioned within FUPASA's structure: an Executive Director, a forestry expert, an energy expert, an administrative

assistant, and legal and financial assistants. The private sector covers the cost of office maintenance, supplies, legal and administrative support. FUPASA has applied to the Japanese government and USAID Panama for start-up funding and is awaiting responses. FUPASA will also seek financial support from the Work Bank. As part of its long term funding strategy, FUPASA became the first AIJ entity in Latin America to be established as a private, not-for-profit foundation, which will be able to receive tax-deductible contributions from Panamanian corporations and individuals.

## ARGENTINA

The Argentinean Office of Joint Implementation (OAIC) was created in 1998, as part of Argentina's pioneering stance on climate change. That year, Argentina hosted the Fourth Conference of the Parties. During that meeting, Argentina became the only developing country to announce its interest in assuming voluntary commitments to reduce GHG emissions between the 2008-2012 period. Soon after the voluntary commitment announcement, presidential decree #822/98 proclaimed the development of the OAIC.<sup>119</sup>

In 1999, a working group was established to design the structure, functions, evaluation criteria, etc., of OAIC. The working group included: the Ministries of Agriculture, Industry, Foreign Affairs, Energy, and Natural Resources. NGOs and Universities were invited to comment, but response was limited. However, the establishment of the entity was rapidly accomplished as a result of strong government support.

OAIC has been entrusted not only with the evaluation and approval of mitigation projects, but with the development of

---

<sup>119</sup> <http://www.medioambiente.gov.ar/oaic/default.htm>

the national climate change policy.<sup>120</sup> The OAIC was also the main force behind the development of the country's mitigation targets, based on several economic scenarios.

The development and funding of the OAIC is purely governmental. It functions as a division of the Secretariat for Sustainable Development and Environmental Policy of the Ministry of Social Development and the Environment. The OAIC is physically housed within the Ministry of Social Development and the Environment. However, one of the OAIC's main concerns is to encourage civil society and the private sector to become active players, together with the government, in disseminating information on climate change in Argentina.

In 1999, the Argentinean province of Misiones requested the technical support of CSDA for the creation of a provincial level entity and the design of a conservation and reforestation project for the Green Corridor. With World Bank funding and in coordination with the Misiones Ministry of the Ecology, CSDA organized a series of training seminars, which again incorporated the experience of Costa Rica and Guatemala. The situation of Misiones was unique in that it would have to comply with national level climate change policy, while still implementing provincial level priorities. The legal framework, structure, and operational modalities for the Misiones Joint Implementation Unit were established, and a reforestation and conservation project for the Misiones Green Corridor was designed. Unfortunately, the efforts underway in Misiones were brought to a halt by a change in political leadership.

## COLOMBIA

In 1997 the World Bank and the Swiss government started a National Strategy Study Program, the purpose of which is "to provide the relevant national authorities and other stakeholders with an opportunity to develop and analyze options to better understand the issues and opportunities presented by potential international markets and other financing opportunities for greenhouse gas (GHG) offsets."<sup>121</sup> This was the first NSS Program operated in Latin America. The study spanned the period between May 1999 and April 2000.

In order to develop a National Strategy for the implementation of a CDM entity, a governmental group was put together including the Ministry of Mines and Energy, the Institute of Meteorology and Environmental Studies and the Ministry of the Environment. The group received the technical support of CSDA. Based on a review of existing AJI entities, an understanding of the functions of a national entity, and a study of potential transaction costs, the group made a recommendation for the creation of the Colombian Foundation for Greenhouse Gases Mitigation (CFGGM), a non-profit organization combining both the public and the private sector in order to best implement the assigned responsibilities.<sup>122</sup> The CFGGM would have a governing council made up of a total of two participants from the government, two from the private sector, and one NGO representative. The goal of this entity is to position Colombia

<sup>120</sup><http://www.medioambiente.gov.ar/organiza/ssoypa/oaic/default.htm>

<sup>121</sup><http://wbln0018.worldbank.org/Networks/ESSD/icdb.nsf>

<sup>122</sup>"Diseño de Instituciones que Maximicen los Beneficios Potenciales del MDL para Colombia." page 23.

among the top five countries in the region in the international market of CER sales.<sup>123</sup>

In 1999, Colombia submitted an application to the World Bank<sup>124</sup> for funding to support the development and design of the national entity. For the implementation of the entity, the Government offered to cover the local costs of consulting services, including local transportation. The Government also offered to finance some of the software costs and publication requirements. Although the design of this entity is complete, the implementation of it has not yet taken place.

## ECUADOR

Ecuador was one of the first developing countries to ratify the Climate Convention in 1993. From the beginning the National Institute of Meteorology and Hydrology (INAMHI) was involved in addressing climate change issues, specifically in the analysis of the vulnerability of Ecuador in the areas of climate and hydrological changes. Under its leadership, several studies were implemented: one funded by USAID, another in the coastal region funded by the government in the Netherlands, including the incorporation of Ecuador in the international CC Train program, and initiated the National Communications to the Secretariat.

In 1998, the Ministry of the Environment took a position of leadership in climate change issues, focusing on mitigation activities that the country could offer. In 1999, Ecuador was among the first countries to ratify the Kyoto Protocol and

established The National Climate Committee (CNC). The CNC is presided by the Ministry of Environment and incorporates representatives of the Ministry of Energy and Mines, Ministry of Foreign Relations, Counsel of Productivity in the Coast and Mountain Areas, CEDENMA (NGO umbrella group), National Counsel of Universities, and INAMHI. The role of the CNC is to promote education, capacity building and other programs that allow the country to benefit from the CDM.

At the beginning of the year 2000, with the change in government, the implementation of CDM activities was declared a priority by the new Ministry of the Environment. In June, by request of the Ministry and with AID funding, CSDA held a multisectoral working session in Quito to define project eligibility criteria, evaluation procedures, and legal framework for a national CDM authority. The most interesting outcome was the structure of the entity. For the first time, a national program would have two entities instead of one.

The Ministry of the Environment is the National Authority in charge of evaluating and approving CDM projects. It has formed a new unit, the “Unidad de Cambio Climatico” (UCC) with the purpose of coordinating all climate change issues in the country. This unit has the specific task of evaluating and approving CDM projects, and in so doing follows pre-approved procedures. Upon recommendation of the UCC, projects are ultimately approved by the Minister of Environment him/herself.

In addition, a second and separate entity shall be created with the responsibility of disseminating information, building capacity and, at the request of project developers, preparing CDM projects for review. This entity, the “Corporación Ecuatoriana del Mecanismo de Desarrollo Limpio (CORDELIM)” is conceived as a private corporation, although it will share

<sup>123</sup> “Diseño de Instituciones que Maximicen los Beneficios Potenciales del MDL para Colombia.”

<sup>124</sup> Proposal submitted by the Ministry of Environment in Colombia to the World Bank.

its Board of Directors with the CNC. The separation of functions traditionally performed by one entity was the result of the desire to build project preparation capacity in one institution, while avoiding possible conflicts of interest. The CORDELIM is fully designed and is currently waiting for its full implementation.

## PARAGUAY

Paraguay ratified the Kyoto Protocol in July of 1999. Shortly after, in December of the same year, it created the National Commission for Joint Implementation (CNIC), through Executive Decree 6754.<sup>125</sup> The Commission is responsible for making national decisions on the flexibility mechanisms of the Kyoto Protocol. The Ministries of Environment, Foreign Relations, Public Works and Communications, the Faculty of Agrarian Sciences, the College of Forestry Science Graduates, and a representative of the environmental NGOs compose the CNIC.

The government of Paraguay developed a national entity, Oficina Paraguaya de Implementacion Conjunta (OPIC), in February of 2000. OPIC implements the mandate of the Executive Secretariat of the CNIC. The national entity was developed with great support from government and with minimal international assistance. Some of the international assistance came from: the German Gesellschaft für Technische Zusammenarbeit (GTZ), for technical assistance; The Nature Conservancy (TNC) with funding from United States Agency for International Development (USAID) for technical assistance; Corporación Andina de Fomento (CAF) and United Nations Development Program (UNDP) for

capacity building. The entity is designed to implement activities at the technical, legal, and institutional levels for the AIJ phase and the CDM.

Currently, the OPIC is the most staffed national entity in Latin America with a total of nine members. An Executive Director, five technical experts (three in forestry and 2 in environmental impact and environmental law), and three administrative support staff members make up the entity. The funding for the staff and its activities comes solely from the Paraguayan government.<sup>126</sup>

## Nicaragua

Nicaragua ratified the Kyoto Protocol in November 1999. Since 1998, it has received numerous funding for activities related to implementing the Climate Change Convention and the Kyoto Protocol. Among the funding agencies the government of Finland, the GEF, the World Bank, and the UNDP have all been active in the development of the activities.

The Ministry of the Environment is in charge of promoting activities to address climate change issues. Currently, a proposal was submitted to the World Bank to design and implement a plan of action for addressing climate change nationally. Furthermore, the government is looking for funding to develop their national CDM authority, but up to date, this has not yet been executed.

<sup>125</sup> "Programa Paraguayo del Carbono"; Oficina Paraguaya de Implementación Conjunta, Comisión Nacional de Implementación Conjunta. OPIC/S30/2000/196, July 2000.

<sup>126</sup> Ibid

## A Comparison of Key Features

Since a national CDM authority was not compulsory until after November 2000, the national AJ entities, which were created in Latin America between 1994-2000, were all of experimental nature. They varied widely in three main features: legal nature, sources of technical and financial support, and responsibilities with which they were entrusted.

The legal nature of these entities spans across the entire gamut of possible designs. Costa Rica has a mixed entity where private, public and NGO sectors participate equally. El Salvador, Argentina, Bolivia and Paraguay have entities that are fully governmental, in fact, simply a specialized section of the respective Environment Ministry. Guatemala has a private sector institution, Honduras a non-governmental organization, and Panama a non-profit organization. Finally, Ecuador has one private sector entity and one public sector entity.

The sources of funding also vary. El Salvador and Argentina seem to be the only entities fully funded by their national government. Bolivia, Colombia and Paraguay have received support, in addition to that provided by the government, from the multilateral institutions such as the World Bank, UNDP and CAF, as well as from bilateral development agencies of the United States and Germany. Honduras is fully funded by official development aid from abroad. Costa Rica and Guatemala have received funding support from their local private sector.

Finally, there are differences in the purposes for which the entities were created. Admittedly, the main driver of the original Latin American interest in climate change is the possibility of benefiting from the emerging market of

mitigation projects. (It was only after Hurricane Mitch that some of the countries in the region began to become increasingly concerned of vulnerability and adaptation issues.) It therefore is not surprising that in some countries the entity created with the responsibility of promoting, evaluating, and approving projects is at the same time charged with the development of national climate change policy. Such is the case of Costa Rica, Argentina, Guatemala, El Salvador, and Panama. In other cases, the normative role has been separated from the evaluative role, by creating a multisectoral body to develop overall policy and oversee the project-related entity. Examples can be found in Colombia, Paraguay, and Bolivia. Ecuador is a unique case, in which the project-related roles have been split over two entities of different legal nature.

No one approach is better than the other. Each country must design according to the national needs and possibilities. Each Latin American country experimented with an approach that seemed appropriate and beneficial to the national circumstances. The major differences are summarized in the table 3.1.

**Table 3.1 Comparison of Latin American AJ entities**

Country	Official Start-up date	Funding support	Nature of entity	Role
Costa Rica	June 1994	National government, private sector, NGO, World Bank	Mixed (NGO, private, public)	Normative/Evaluative
Guatemala	June 1997	USAID, private sector, World Bank	Private	Normative
Bolivia		National government, US Country Studies	Public	
El Salvador	May 1998	National government	Public	Normative
Argentina	1998	National government	Public	Normative
Honduras	November 1999	Canadian Government	NGO	Normative

Panama	January 2000	National government, USAID	Non-profit	Normative/Evaluative
Paraguay	February 2000	National government, GTZ, TNC, CAF, UNDP	Public	
Colombia		World Bank, national government	Private	Evaluative
Ecuador	2000	National government, USAID, CAF	One public; one private	Evaluative

As the CDM international regime matures, each of the above countries will have to modify their AJ entities to comply with the new prerequisites of CDM national authorities. However, during the AJ pilot phase and under no direction from the UNFCCC, each country created an entity that would best suit the particular national needs, under the conditions, which were prevalent at the moment. Each one was able to learn from previous experiences in neighboring countries, each one innovated the concept in order to maximize their potential. All these pioneering AJ entities deserve highest recognition for having blazed a trail in uncharted territory. It was not an easy task.

and the opportunities provided by the financial mechanisms of the Kyoto Protocol. At this stage there is usually questioning of the merits of devoting time and effort to a global concern to which developing countries have not contributed much, versus devoting the same resources to pressing national issues, such as health, education, and income.

It is clear that in developing countries national challenges have priority over global concerns. However, it is helpful to understand that the climate change regime is developing financial instruments which can further national goals while they at the same time contribute to the global mitigation effort. Projects that may be considered under the CDM are typically projects that promote a healthy energy generation mix, increase energy efficiency, help protect wildlife habitat, and/or protect watersheds. In addition, many of these projects create employment, and have ancillary environmental benefits above and beyond climate change mitigation.

## Challenges of Institutionalization

After six years of promoting the institutionalization of climate change mitigation efforts in Latin America, we can identify some of the main challenges faced by developing countries. The lessons learned may be relevant to any country interested in developing a national CDM authority.

## AWARENESS RAISING

In most cases, the process seems to have been a step-by-step approach, an organic process that has evolved over time. It is apparent that the very first step is one of fundamental raising awareness around both the threats of climate change

The most difficult aspect of the awareness raising stage is managing expectations. In the attempt to spur interest in CDM activities, it is all too easy to fall into the temptation of overcoming the “CDM is irrelevant” attitude with a naïve claim that CDM will solve all sustainable development shortcomings. It will not. CDM is one instrument to finance a certain subset of sustainability efforts, but it does not cover all sectors and is not the only financial instrument. If expectations are not managed from the beginning, one might later waste much precious time bringing CDM to its realistic dimensions.

## POLITICAL WILL

In some countries the political leadership has understood the relationship between climate change and national economic development. It is evident that in those countries in which climate change mitigation has been made a priority, progress has been made sooner rather than later. Long term planning, vision and political will are critical to a successful implementation. Precisely because climate change is not a short-term issue, nor are the benefits of CDM participation evident immediately, it is all too easy to get sidetracked by more urgent short term needs, leaving the important but not urgent issues on the back burner.

## SECTORAL COORDINATION

Cross-sectoral coordination is indispensable. The very nature of this enterprise is multisectoral. Governments sign and negotiate the Climate Change Convention, most of the implementation will be performed by the private sector, and NGOs often have the know-how. While a total integration of these sectors is not possible in all countries, at least a minimum of collaboration is absolutely necessary. Perhaps the most difficult issue in this is the role of the government. Given the fact that governments assume ultimate responsibility of the implementation of the Convention, there is a natural tendency for governments to assume full responsibility of CDM activities. In the final analysis, the "export" or sale of emission reductions is a national decision and requires government authorization. However, that does not necessarily mean that the government needs to incur all the costs or perform all the work related to project promotion and evaluation. As we have seen in the previous country descriptions, there are many possibilities of distributing the load. Most importantly, the lesson learned in this area is that it is critical to have public control measures, which ensure the environmental integrity of the system, but

these measures cannot be so weighty so as to kill any private initiative to design and implement a project.

The second aspect of sectoral coordination is that which is necessary within the various sectors of the government itself. Typically, CDM activities can involve the agriculture, energy, transportation, environment and foreign affairs sectors of the government. It is understandable that one or more of these sectors will be interested in taking the lead on CDM activities. It is however critical to reach agreement on which sector will take the lead, while encouraging the participation of the other sectors.

## CHAMPION

A key component of success has been the existence of a local champion. This champion could come from the governmental side, from an NGO, or from the private sector. But a champion must be: one who does not sleep at night, thinking about how to form the CDM authority and make it work effectively. As we have seen, broad participation is important, but in this case many cooks do not spoil the soup, they simply do not get it cooked at all. It is only in those countries where a champion has emerged that the AU entity is actually functioning.

The champion needs to have a clear idea of what has to be done. He/she must have an indisputable convening power, in order to be able to bring the different sector representatives together at the appropriate times. And most importantly, the champion must be able to provide continuity to the process, particularly during times of change in the political leadership.

## **IMPERFECTION**

Finally, and perhaps most importantly, it is well to remember that climate change and its mitigation is a new challenge being faced by humanity. We have never done it before. Hence we are all learning together how to do it. Some countries are further ahead in their efforts some are further behind. But unequivocally, every country is unique. We can learn from each other, but cannot “cut and paste” solutions. Everything must be adapted to the national reality. We cannot expect to make it perfect the first time. Mistakes are only lessons learned, and an enriched experience. The process is iterative. Do not expect to check off a to-do list, and see a completed institution. Institutions grow and change. A national CDM authority is no exception to that rule.

## **Conclusion**

The lessons learned during the AIJ project has demonstrated that there is not a sole approach to developing national programs, but rather a number of approaches that best fit the circumstances of a specific country according to their needs and resources. Under the AIJ pilot phase countries did not have specific guidelines to follow on how to develop their national programs, partly because it was a voluntary decision to develop such entities. However, countries seemed to follow similar patterns in the development of their programs and as we have seen just in Latin America, while differences have existed from program to program between countries, their similarities are greater than their differences.

The CDM, on the other hand, will provide clearer guidelines on how to develop national authorities. This is partly a

result of the current text, which states that in order to participate in the CDM the parties will need to establish a national authority. For this, there will be guidelines defined on the criteria needed to implement the national authority. Latin American countries have demonstrated leadership in the implementation of these national programs and their example will serve to implement future CDM national authorities throughout the region.

## **References**

<http://wbln0018.worldbank.org/Networks/ESSD/icdb.nsf>  
“Diseño de Instituciones que Maximicen los Beneficios Potenciales del MDL para Colombia.”

Proposal submitted by the Ministry of Environment in Colombia to the World Bank, 1999.

“Programa Paraguayo del Carbono”; Oficina Paraguaya de Implementación Conjunta, Comisión Nacional de Implementación Conjunta. OPIC/S30/2000/196, July 2000.

<http://www.medioambiente.gov.ar/organiza/ssoypa/oaic/default.htm>

<http://www.medioambiente.gov.ar/oaic/default.htm>

“Propuesta de Organización. Programación y Financiamiento de la Oficina de Implementación Conjunta de Honduras, para la Reconstrucción Nacional.” January 1999.

[http://www.marn.gob.sv/des\\_lim.htm](http://www.marn.gob.sv/des_lim.htm)

National Report on Activities Implemented Jointly during the Pilot Phase. Republic of Guatemala, July 1999.

Figueroes et al, Implementing JI/AU: A Guide for Establishing Joint Implementation Programs, Washington, DC, November 1996.

Dopazo, Eduardo. Unpublished document: "Oficina Guatimalteca de Implementación Conjunta, Actividades Realizadas 1996-1998", August 2, 2000.

Power point presentation of OGIC, September 1997.

Reporte Nacional sobre Actividades Conjuntas Durante la Fase Piloto, Republica de Costa Rica, February 1999.

<http://www.fundesa.guatemala.org/OGIC/ji.html>

# Chapter 4: Institutional Building of National CDM Authorities

Chapter updated by: Helena Olivas from the “Implementing JI/AJ: A Guide for Establishing Joint Implementation Programs”, November 1996.

## Introduction

The AIJ pilot phase did not require the establishment of a national entity to develop carbon mitigation projects. However, to facilitate the generation of these types of projects, some countries decided early on to create their national entities on a voluntary basis. As discussed in the previous chapter, several entities were created during the period of the JI/AJ pilot phase, but we see new entities currently under development that begin to adopt the term CDM. These newer national entities are found in countries such as Panama, Ecuador, and Honduras.

While the Kyoto Protocol made no mention of having national entities in response to submissions from several countries, in SBSTA Chairman Kok Kee Chow introduced the requirement of a national CDM Authority into the negotiating text. As of COP-6 part II, the official text requires that non-Annex I parties will have to create a national authority to facilitate and promote CDM projects.<sup>127</sup>

### Participation Requirements:

- 1- Participation in a CDM project is voluntary.
- 2- Parties participating in the CDM shall designate a national authority for the CDM.
- 3- A Party not included in Annex I may participate in a CDM project activity if it is a Party to the Kyoto Protocol.

Source: [www.unfccc.de](http://www.unfccc.de), FCCC/SBSTA/2000/10/Add.1 (PART II)

There is thus a clear decision that countries wanting to benefit from the CDM must have a CDM national authority. This Chapter describes the processes used by several countries in the establishment of AIJ/CDM national programs.

## Before Creating a National CDM Entity

Prior to creating a CDM national entity, Parties should perform an assessment of the existing political, environmental, and socio-economic context in the country. At a macro level it is crucial to identify the national development objectives of the country in question, as well as the strategies chosen to implement these. At a more micro level, it is important to determine how climate change and GHG mitigation issues complement or conflict with those objectives. Some Parties have already made such definitions in their Climate Change National Action Plans. Once these are defined then countries can truly create viable sustainable development CDM criteria for their national entities.

The complexity of the assessment will depend on the specific factors of the country as well as the resources available. For example some countries may evolve a good working relationship among NGOs, the public, and the private

<sup>127</sup> FCCC/SBSTA/2000/10/Add.1 (PART II); p.16-41.

		Legal and regulatory frameworks
		Levels of knowledge, technical expertise, and resource commitment to the CDM
		<b>Political and Institutional Environment for the CDM:</b>

sectors, allowing them to distribute responsibilities and work together toward creating the national entity. Other countries may have a more distant relationship among the different sectors, which makes it more difficult to work together toward a common goal. Furthermore, some countries may have a single sector taking the lead on climate change and defining the design and implementation of the entity. Each country will have to tailor its approach according to its specific set of circumstances.

The assessment phase could involve meetings amongst the public and private sectors, scientific institutions, as well as environmental and development organizations. These groups or a combination of such, could consider the following factors when making their initial assessment for implementing a national CDM entity:

	What factors to assess before creating a National CDM Entity
CDM	Political and institutional environment for the CDM
National development objectives, strategies, and programs	

	<b>Ratification and compliance of the Kyoto Protocol:</b> Participating in the CDM is voluntary; however, developing countries must have ratified the Kyoto Protocol in order to engage in CDM projects.
	<b>Political stability:</b> It is helpful to have a frank examination of the commitment by the country's political administration to the CDM concept. Since CDM projects present long-term effects and opportunities there is often opposition from a number of sources. This is especially true when the project involves public funds, where opponent groups may include skeptics of the threat of climate change, environmentalists that oppose possible environmental effects of a certain project, activists that may feel that there are more urgent social or economic issues to be supported, etc.
	<b>Institutional rivalries:</b> It is not uncommon to find institutional envies as the CDM entity arises. There may be clear competition between institutions, which desire control

over the new program. This rivalry may be acute if the program brings financial or status benefits to its staff members.

**Level of inter-sectorial communication:** Since CDM projects can include a variety of project types (transportation, industry, energy, and forestry), the creation of the entity will be importantly affected by the level of communication and collaboration that exists amongst the sectors. It will be important to assess whether the country will need to invest resources and effort in improving the channels of communication between the sectors. If there is already a fair degree of interchange, then the assessment can be oriented towards identifying the best use of the existing channels of communication.

## National development objectives, strategies, and programs

National criteria for CDM projects should be based on national development objectives. Thus it is important to identify goals and policies already established for socio and economic development in areas related to climate change, such as energy, land-use change, transportation, etc. Some examples of programs where this information may already have been examined are: National Action Plans with support of the U.S. Country Studies Program, and the National Strategy Program supported by the World Bank. Countries may also have in place sustainable development programs or national environmental plans that may already be active in areas relevant to those of the CDM, such as forest policies, and promotion of renewable energy and clean technologies.

## Legal and regulatory frameworks

In the assessment for developing the CDM national entity, laws that create opportunities or constraints for developing CDM projects must be identified. Some laws may limit investments in certain sectors such as energy or forestry; other laws may place barriers on trade, foreign investment, which may discourage CDM development. If these barriers are significant, then part of the assessment can include implementing strategies to overcome the barriers in place. On the other hand, the legal system may have laws, which favor the development of CDM projects. Some laws may offer incentives for certain types of projects in certain regions of the country; others may offer opportunities for foreign investment in renewable energy generation, etc.

## Levels of knowledge, technical expertise, and resource commitment with regard to the CDM

**General level of interest and understanding:** The level of understanding of the CDM varies greatly, even within geographic regions. Some countries are ahead, having participated in the pilot phase of joint implementation. Even amongst the countries that have participated in the AJI pilot phase there is a vast range of expertise. For example in Latin America there are countries such as Costa Rica that are ahead of the game having participated in the AJI pilot phase since it was announced in 1995. Other countries in Central America also developed national entities for AJI programs and implemented AJI projects; these include Honduras, Guatemala, Panama, and El Salvador. Countries such as these will have to update their national entities to fit the CDM modalities defined by COP-7 in November 2001. On the other hand other countries have limited experience in developing national entities as well as CDM projects due to the reduced participation during the AJI/JI pilot phase.

These countries may need to invest in general awareness raising, prior to building institutional capacity.

**Level of technical/scientific expertise in project development and evaluation:** The country will need to assess its local technical skills and scientific expertise to determine the level of external capacity building that they will need for developing, appraising, and certifying projects. These skills will need to be specific to GHG mitigation, sequestration, or avoidance projects in the areas of energy, transportation, industry, and forestry.

**Availability of resources:** An initial assessment of possible funding for implementing a CDM national entity will be necessary. In order to do this, the different parties interested in implementing the entity will need to be identified, as well as their willingness to provide support such as funding, personnel, in-kind support, etc. The needs and resources available will influence the structure of the CDM entity.

some point throughout the development and implementation of the entity. The steps for this process are:

		Define the entity's mission and objectives
		Obtain official status for the entity
		Review and establish legal framework
		Align program strategies with national sustainable development priorities
		Attain broad stakeholder participation

## Steps in Creating a National CDM Authority

Once the needs assessment is accomplished, the next steps will need considerable commitment on the part of the local agents. While countries may get input from external parties, each country is responsible for defining the agenda of the national authority according to the country's development goals.

The following steps provide a general framework for creating a CDM national authority. These steps may occur in parallel or in a different order, but each will need to be addressed at

		CDM may have to first promote governmental endorsement of the international accords. Even countries that have signed on to both accords may still need to invest in capacity building of their legislators, policy-makers, and other decision-makers.
Obtain financial and non-financial resources		In addition to legislative approval of the FCCC and the Kyoto Protocol, it is critical to obtain official sanction of the CDM initiative and to enlist the support of key political figures such as the Ministers of Environment, Energy, Transportation, Natural Resources, Agriculture, Trade, and Foreign Affairs. Official recognition may come in different forms, depending on the degree of knowledge and acceptance of the CDM and administrative and legal procedures of the country in question. Validation of the CDM entity may come from the legislature or a presidential or ministerial decree.
Establish relationships with the National Focal Point for climate change, and ministries	Staff the entity	An agreement validating the CDM entity will contain clear statements regarding its legal justification, authority, objectives, organizational structure, functions, priorities, and procedures. In some cases, however, the CDM entity is needed to help clarify the objectives and structure, especially during start up. Given this dilemma, it is important to point out that a document declaring the legal status of a CDM body need not necessarily declare from the outset, the who, how, what, and where. At minimum, it should contain clear statements regarding the rationale for creating an entity, the legal authority it is granted, and should provide guidelines for the process of consultation, discussion, and consensus building, which will be used to develop a concrete action plan for the CDM entity.
		<b>Define the entity's mission and objectives</b>
		At a global level, the CDM entity must contribute to the ultimate objective of the Convention. At a national level, it should help meet national sustainable development goals. However, the mission of each CDM entity should be defined as precisely as possible, according to the priorities of each country.
		<b>Obtain official status for the program</b>
		Although different sectors may participate in CDM, it is the government that makes the commitment to work toward the reduction of GHGs. Some countries have not yet ratified the Kyoto Protocol. In these countries, parties interested in the
		The national legal framework will affect the success of a CDM entity. Potential CDM investors will look for countries where

the regulatory environment is most conducive to investment. For this reason, concurrent with efforts to create institutional capacity, those interested in seeing CDM move forward in their country should consider the relative strength of their incentives for investment. The following are some examples of issues where the legal and regulatory environment will be critical:

**Investment:** Legislation regarding foreign participation in domestic companies, remission of profits earned abroad, foreign involvement in the energy, transportation, or investment incentives in certain geographical regions.

**Taxation:** Tax incentives for certain types of investment, taxes on remissions of earnings, and import or export duties.

**Energy:** Rules concerning foreign owned power generation, transmission or distribution facilities, incentives for “clean energy” projects, and constraints on the length or type of concessions.

**Environment and Natural Resources:** Pollution regulations, incentives or disincentives for investing in protected areas, endangered species provisions, forestry practices and constraints on logging, environmental impact studies, agrochemical regulations, rules concerning exploitation of water and waterways.

**Urbanization and Land development:** Zoning regulations, waste disposal regulations, ease or difficulty of obtaining construction permits, incentives for development in underdeveloped regions.

Depending upon the development priorities of the country in question, some of these laws may be very compatible with CDM investment. As with all trade and investment, those

nations with the most transparent rules and the most streamlined investment regimes will be in the best position to compete for CDM investment resources.

### Align program strategies with National Development Priorities

The CDM is meant to contribute to national sustainable development. This should be seen not only as a prerequisite, but as a real financial instrument which can channel resources towards the projects that are most likely to further national interests. For example, countries with inadequate energy supply may want to encourage investment in energy projects, whereas nations with deforestation problems may prefer to invest in projects that lead to reforestation and/or recuperation of degraded lands.

### Attain broad stakeholder participation

One of the most challenging aspects of implementing the CDM entity is determining who should have an active role. Some countries have centralized past AIJ programs within the government. Other countries have achieved active participation from all sectors of society (civil, NGOs, private and public sector), and different sectors of the economy (industry, energy, agriculture, forestry, etc...).

The FCCC and the Kyoto Protocol require governments to designate a national authority to approve CDM projects and report annually on progress. Also, since one of the goals of the CDM mechanism is to keep developing countries in reaching their national sustainable goals, governments will need to ensure that CDM activities are compatible with their sustainable development agenda. Governments will also be

key in cooperating with the private sector to market the CDM proposals to prospective investors.

This does not mean that the government will need to dominate or exclude other groups from participating in the implementation of the national CDM authorities. In fact, even in countries, where the governments have the resources to implement the national CDM authorities, may still want to consider spreading the CDM initiative to other groups in order to broaden the understanding of the concepts and benefits of the CDM amongst sectors. This will benefit the country by facilitating the involvement of different stakeholders in the process.

The private sector can help ensure an emphasis on efficiency and the development of clear and simple rules. Including the participation of the private sector and institutionalization may allow for guidance of a less bureaucratic approach and a more results-oriented approach in the procedures. Also, the private sector will be key in driving the CDM as investors seek cost-efficient means of mitigating their GHG emissions.

The NGO community should also be incorporated in the development and implementation of the national CDM entity, since they can often bring a much-needed environmental and social focus to the institutional agenda. NGOs are also often repositories of valuable scientific expertise and technical know-how, which help countries develop and evaluate projects.

## Obtain financial and non-financial resources

Obtaining funds for the national CDM entity will be crucial. Where the funds will come will greatly depend on the stakeholders involved. Some countries will be faced with public funding constraints, which will limit the public

contribution for the implementation of the CDM entity. Therefore, a way to face this situation will be to broaden the sources of logistical support. Some examples of resources that may be required to implement the CDM entity are:

**Staffing:** Government Agencies can “donate” the time of technical and support personnel, assigning them part of full-time to the CDM entity. NGOs or private sector firms may donate assistance in the form of consulting hours for specific tasks or advisory roles. This approach has proved successful in Costa Rica under the AIJ/JI phase.

**Physical facilities:** Government institutions, industry chambers, or private parties with an interest in the CDM may contribute idle or underutilized physical space for offices, as well as logistical support, such as telephone lines, photocopiers, and fax transmission services. A good example of this was Guatemala and their JI offices.

**Technical and scientific expertise:** Many local and international NGOs offer their services in areas such as project development, monitoring, verification, and overseas marketing. This support may be motivated by a series of factors, including the future of service contracts, a desire to further sustainable development, or an interest in seeing CDM advance. This assistance may be complemented by scientific expertise “donated” by universities or research institutions, which also hold a stake in future CDM activities.

**Internal “education” and external promotion:** Trade promotion or export agencies may offer facilities for local workshops and promote CDM projects internationally, incorporating CDM as an additional product in their export or investment portfolios. Also, the Ministry of Foreign Relations may be able to educate their abroad staff to actively promote CDM projects or at least refer interested parties to

the right source of information. Private sector chambers can also play a promotional role.

**Additional cash for operating budget and office equipment:** Host country governments can approach multilateral agencies, governments of Annex I countries, and international NGOs for resources. As indicated in the Kyoto Protocol, Annex I countries will channel resources to non-Annex I parties, thus helping both groups of countries to comply with the Protocol's commitments.

**Transportation:** Government agencies can use existing vehicles for occasional field visits, transportation of visiting officials or consultants.

**Management/Leadership:** This issue can be the most controversial and challenging issue in bringing together resources for a CDM entity. It is challenging to find qualified personnel to assume leadership in a new field such as the CDM, and also it is difficult to resolve internal struggles for the leadership of an institution that is perceived to grow with prestige and international exposure.

## Staff the program

The question on how to staff the CDM entity will depend on the structure that is adopted for the CDM entity, the diversity of organizations involved, the size of the entity, and the resources available. Following are some of the issues to consider when staffing:

**Permanent vs. Ad-Hoc:** After the original start-up phase, should the office operate year-round, or should it convene only to evaluate and approve projects? A permanent staff offers more continuity to the CDM effort and ensures ongoing monitoring of CDM trends and opportunities around the

world. In terms of international project marketing and coordination with potential project funders or developers or other international agencies, a permanent staff would also guarantee more efficient response time. On the other hand, an ad-hoc organization would probably save on operating costs.

**Full-time vs. part-time dedication of personnel:** Will personnel be "on loan" from their organizations, or will they become full-time staffers with a "permanent" position in the CDM office? There are potential advantages and drawbacks to each alternative. Dedicated staffers have more independence but constitute more of a financial burden. Part-time personnel who divide their time between their "home" organization and the CDM entity will have the advantage of remaining "in tune" with their home organization and the sector they represent, a benefit to the CDM entity. However, they will lack independence and may even encounter ethical dilemmas if the goals of the two organizations come into conflict. In addition, it may be more difficult to control the hours and quality of work of part-time personnel.

**Technical/scientific vs. policy/administrative:** Should the CDM national entity be made up mostly of technical personnel, who will be able to evaluate project baselines and determine adequacy of carbon-accounting methodologies, or should the office stress policy and strategic issues such as how to market national projects? Undoubtedly both types of personnel will be needed; the challenge will be to determine the right balance of both types, considering that most national entities will be unable to hold large groups of staff. Another challenge will be to determine the right balance of technical personnel for different sectors of the economy that are prone to be involved in CDM project development, such

as the forestry, agriculture, energy, and transportation sectors.

#### **Build local expertise or hire international experts:**

Bringing international experts to build the CDM entity team can be a fast way to bring quick and efficient results, however it will usually be more costly. In addition, it is important to remember that international experts will often lack local perspectives that will be necessary to implement the national CDM entity. An external party may not have a clear vision of local reality, and therefore may not be able to propose, develop, or implement strategies and solutions that are appropriate to the local setting.

#### **Relationship with existing climate-change or meteorology institutions:**

This question will arise in relation to meteorology offices and other national agencies dealing with climate change. Since some of these scientific agencies may already be involved with inventories of emissions and carbon sinks, it is vital to coordinate with them. The matter of whether these types of organizations should be absorbed by CDM office, or vice versa, is really a question of the mandate of the existing agencies. If they were created solely to measure GHG emissions, they may be small and new enough to become a part of the new CDM entity. If however, they are long-standing institutions with a number of other tasks, it may be preferable to invite them to participate in the formation and continued activity of the CDM entity.

## **Establish relationships with Ministries**

The development of CDM projects will require a great deal of contacts between countries. Many of these contacts will often occur between private entities. However, at some point during the life time of these projects governments will need to become involved. The requirement of host country

acceptance of the projects will request the Ministries of Foreign Affairs and Ministries of Environment to be informed of the development of such projects. A second reason to have these Ministries informed is that often staff members of these entities represent their countries at the climate change negotiations. Thus these negotiators should coordinate policy with strategic national efforts being implemented.

## **References**

Climate Change Secretariat, The Kyoto Protocol to the Convention on Climate Change, Bonn, Germany, 1997.

Figueres et al, Implementing JI/AJ: A Guide for Establishing Joint Implementation Programs, Washington, DC, November 1996.

# Chapter 5: Functions of a National CDM Authority- DRAFT

Written by: Matthew Mendis  
Co-authored by: Robyn... and Marcos Castro

## Introduction

The Clean Development Mechanism (CDM) of the Kyoto Protocol to the UNFCCC aims to assist non-Annex I Parties to achieve sustainable development and reduce greenhouse gas (GHG) emissions and to assist Annex I Parties in meeting their GHG emissions limitation commitments. Widespread implementation of qualified CDM projects that meet agreed criteria would achieve the broad goals of the CDM as outlined in the Kyoto Protocol.

To promote and facilitate the development and implementation of CDM projects, non-Annex I countries should establish a national CDM entity ("CDM Office") in their country. The CDM office should have the capacity to evaluate and validate CDM projects based on national and international criteria. To attract project proposals, the CDM office should publish project requirements, project evaluation criteria, and priority geographic areas and sectors for CDM projects. The Office should also provide project proponents guidelines on establishing baselines for projects, additionality requirements that projects must meet, and steps on estimating emissions reduction potential for different project types. In addition, the CDM office should

carry out capacity building and project promotion activities to develop capabilities and interest in CDM projects in the country.

The principal activities of the National "CDM Office" may include:

- Validating eligible CDM project activities that (a) meet national priorities; (b) contribute to sustainable development; and (c) result in real, measurable and long-term benefits related to mitigation of climate change;
- Validating the baselines associated with CDM project activities on the basis of criteria that are established by international rules and national development priorities;
- Facilitating investments in approved national CDM project activities;
- Establishing the rules and guidelines for monitoring of CDM project activities to ensure the availability of the data needed for independent verification of the resulting ERs; and
- Tracking and registering the production and transfer of ERUs/CERs from approved CDM project activities.

## Evaluation and Approval

## **Adopt International Criteria - MARCOS**

that verified and certified emission reductions fully satisfy all KP modalities and other agreed criteria and requirements. This likely will require showing that the emission reductions are real, measurable and additional and that these reductions will eventually be recognized by the Convention of Parties.<sup>128</sup> The approach that is presented here builds on the above principles, is flexible and includes the following specific elements:

## **Establish Guidelines for the Presentation of Projects**

One of the key elements for attracting CDM investments is the development and application, by the host country, of quick, simple and transparent procedures for identifying, screening, evaluating and approving projects that will be eligible for CDM. These will include standardized forms and procedures for receiving, evaluating and approving CDM projects. To achieve this objective, the CDM Office should implement a system to screen, evaluate, approve and monitor CDM projects. The principal objectives of the proposed screening criteria are to:

- Determine if project proposals contain all the required information that is necessary to fairly and accurately assess the suitability of the proposed project for CDM eligibility; and
- Assess the proposed projects that do satisfy the information requirements to determine their suitability for approval as CDM projects.

## **Develop Additional National Criteria - MARCOS**

- A baseline study for the project and an explanation of how additionality and other relevant project criteria will be satisfied.
- A Monitoring and Verification Protocol (MVP) for the project.
- Validation of the project design including the project baseline and the MVP.
- Monitoring of emission reductions and other relevant parameters and indicators.
- Monitoring of emission reductions and other relevant parameters and indicators.
- Periodic auditing of the project and verification that emission reductions have been achieved in compliance with relevant project criteria.
- Certification of verified emission reductions.
- Recognition or registration of the certified reductions by a UNFCCC body.

## **Proposed Procedures for Assessment and Approval of Potential CDM Projects**

Figure IV-1 presents a flow diagram of the key steps that may be involved in the decision-making and approval process, by a National CDM Office, for proposed CDM projects. A brief discussion of each of the key screening,

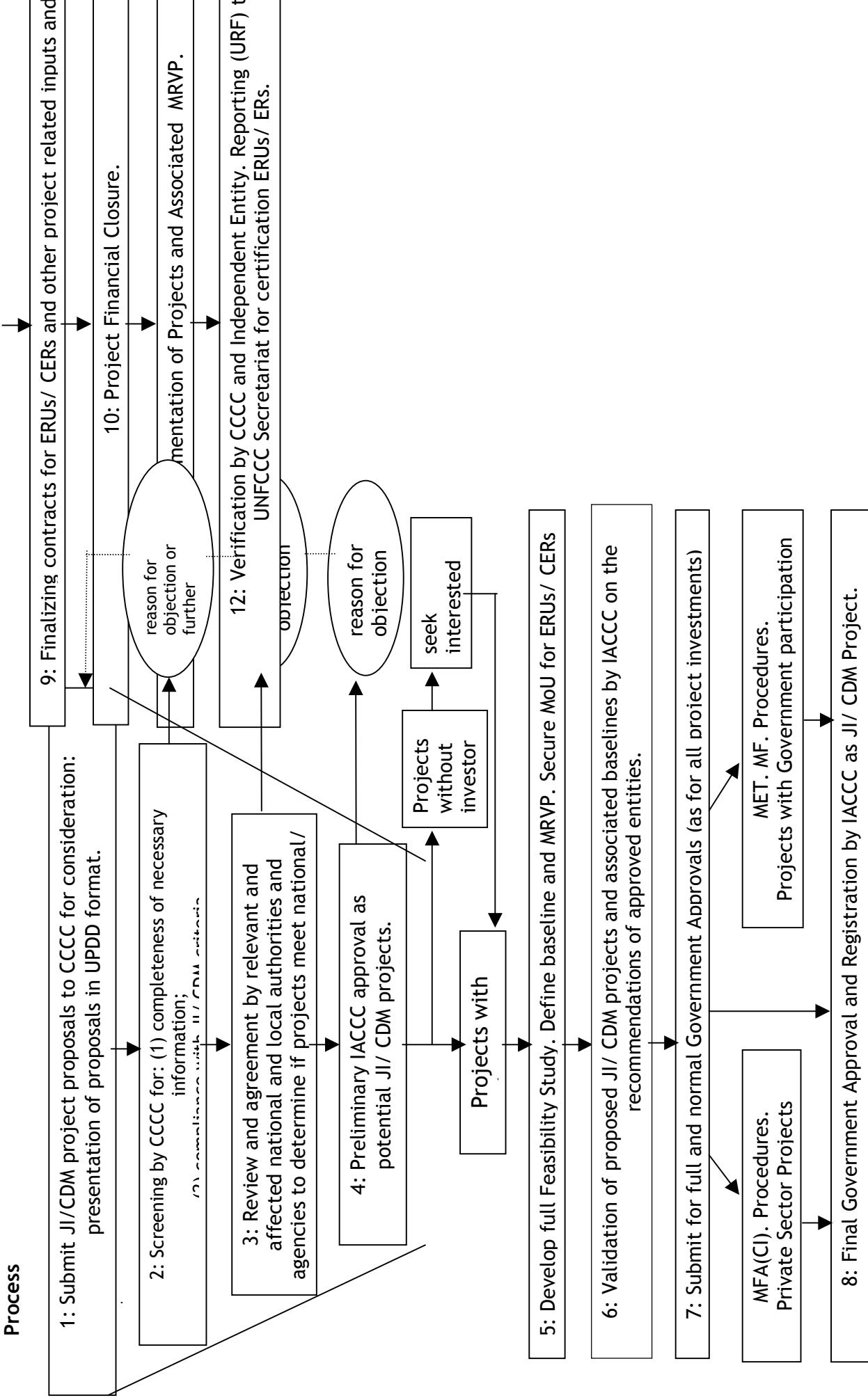
The purpose of all validation/verification/certification activities is to assure the credibility and quality of emission reductions. This requires the application of an agreed framework, ideally an international standard, which can assure international investors and other interested parties

---

<sup>128</sup> PCF Implementation Note Number 4, April 21, 2000.

evaluation and approval steps is presented following the diagram and discussed in more detail below.

**Figure IV-1: Project Screening, Evaluation and Approval Process**



## **Establish Procedures for the Evaluation and Approval of Projects**

The screening criteria for proposed CDM projects are divided into two major segments. The first segment or “Primary Screening” is designed to determine if proposed CDM projects are submitted with all the necessary information required to carry out a detailed assessment of the project against the criteria established for approval and validation. This is essentially a check to determine if the data and information that is necessary to carry out a full assessment and validation of the proposed project is contained within the documentation that is submitted for the validation of the project as a CDM project. The second segment or “Secondary Screening” is designed to determine if the project should, in fact, be approved and validated as a CDM project. As a result, the Secondary Screening process is significantly more detailed and requires the evaluation of the key factors and data associated with the project against the established national criteria for approval and validation of proposed CDM projects. The details of the Primary and Secondary screening criteria are presented below.

Proposals for CDM projects should be submitted in accordance with the format outlined in the CDM “Uniform Project Design Document”. The outline of the CDM Uniform Project Design Document (UPDD) should be based on the proposed Project Design Document format given in Annex B of FCCC/CP/2000/CRP.2/Add.1 and on other related project document formats such as the Global Environment Facility (GEF) and Prototype Carbon Fund (PCF). The following key principles should be used as guidance when project documents are prepared, for screening and validation as well as for monitoring, reporting and verification purposes:

- Completeness of information,
- Comparability (between the baseline and the project and for similar projects),
- Consistency between projects,
- Cost-efficiency,
- Practicability,
- Reliability,
- Transparency,
- Validity,
- Best practices.<sup>129</sup>

## **Primary Screening - against completeness of information in project proposal**

The objective of the Primary Screening stage is to conduct an assessment of the completeness of the information provided in the proposal for the CDM project. The Primary Screening process is not intended to assess the accuracy of the information provided but to assess the completeness and adequacy of the information requested so as to allow, in the Secondary Screening stage, a full assessment of the information of the project proposal against the established CDM criteria. As such, the Primary Screening can be done quickly and by non-technical, mid-level staff.

## **Secondary Screening - against established CDM project screening criteria**

The objective of the Secondary Screening stage is to assess the eligibility and acceptability of proposed CDM projects and

<sup>129</sup> The key principles are adopted from “Operational Guidelines for Baseline Studies, Validation, Monitoring and Verification of Joint Implementation Projects - Volume 1: Introduction - A Guide for Project Developers and Validation/Verification Bodies”, Ministry of Economic Affairs of the Netherlands, May 2000.

to ultimately help the IACC decide on the approval of the proposed project. Projects approved by the IACC will ultimately have to be validated by a designated operational entity against the requirements established for CDM projects. The principal requirements for CDM projects as defined in the Kyoto Protocol were outlined in Chapter 2. The principal requirements include:

- The host country must benefit from project activities resulting in transferable emission reduction units (ERUs) for JI or certified emission reductions (CERs) for CDM;
- Projects must assist host countries in achieving sustainable development and contributing to the ultimate objective of the Convention;
- Projects must result in “real, measurable and long-term benefits related to the mitigation of climate change”; and
- Projects must result in “reductions in emissions that are additional to any that would occur in the absence of the certified project activity”.

In addition to the criteria that will be specifically defined for validation of CDM projects, the following key criteria should be applied during the Secondary Screening and evaluation process to ensure that all projects that pass this screening and evaluation process will have a high probability of being validated as CDM projects:

- 1) Consistency with the UNFCCC and/or the Kyoto Protocol
- 2) Consistency with Relevant National Criteria
- 3) National and Local Environmental Benefits
- 4) Consistency with Kazakhstan’s Strategic Objectives and Operating Principles
- 5) Measurability of Project GHG Emissions
- 6) Contribution to Sustainable Development
- 7) Provision of Long-term Benefits

- 8) Potential for Significant Amounts of GHG Reductions
- 9) Acceptable Monitoring, Reporting and Verification Protocol
- 10) Additional Characteristics of Selected Projects

---

## Capacity Building for CDM Project Development

---

- To select, formulate, and finance technically feasible and “bankable” CDM projects that meet the requirements under the KP and produce certified ERs on a competitive basis, the capacity of domestic and international project proponents in non-Annex I countries to needs to be developed and/or strengthened.

### Technical Training of Project Developers

A broad range of technical, economic and environmental capacity and skills are required to effectively carry out the screening, evaluation and approval of proposed CDM projects. To develop and implement successful CDM projects, project proponents need to identify projects that provide both economic and environmental benefits and are financially feasible. The skills that are required to identify these projects include conventional project due diligence capabilities as well as the knowledge and understanding of the requirements of CDM projects. The most critical skills relate to the understanding of the CDM screening, evaluation and approval criteria discussed in this chapter. Specifically, expertise is needed in the following areas:

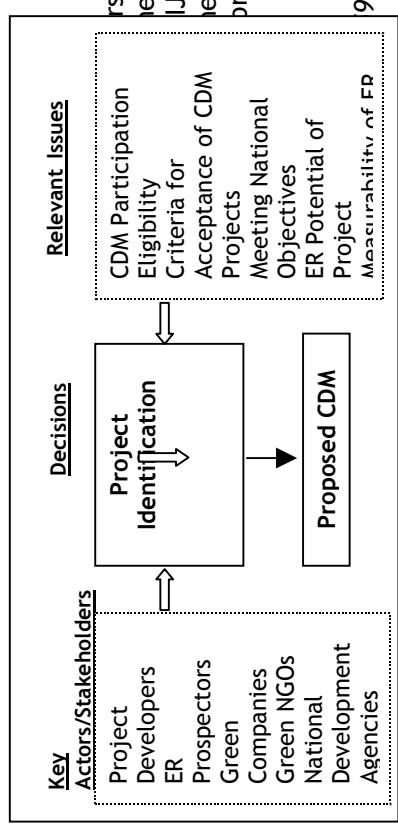
- Expert knowledge and understanding of all the criteria for CDM projects that are defined by the Kyoto Protocol and the guidance issued by SBSTA/SBI.
- Expert knowledge of the relevant national development priorities and the ability to determine if proposed CDM projects meet or support these priorities.
- Technical expertise to determine if the proposed CDM project is technically sound and well designed.
- Environmental impact assessment expertise in order to assess the acceptability of proposed CDM projects against national and local environmental concerns.
- Technical and economic expertise in evaluating the associated “baseline” for the proposed CDM project and determining the emissions and financial addtionality of the project.
- Financial expertise for assessing the financial viability of proposed CDM projects.
- Legal and regulatory expertise to evaluate the legal and regulatory aspects of proposed CDM projects and ensure that the projects are consistent with established national and local laws and regulations.
- Working with independent agents for monitoring, reporting and verification of emissions reductions by

To promote the wide-spread implementation of CDM projects, the CDM office should organize training workshops for project proponents that strengthen their understanding of the primary requirements for CDM projects. Participants to the training courses should include project developers, private companies, government agencies, bankers, non-government organizations (NGOs) and other entities involved in project development.

## Project Formulation

The first and most important step in the CDM project cycle is the identification and formulation of potential CDM projects. A false diagnosis could lead to the expenditure of considerable time, effort and resources, resulting in an ineligible or unacceptable project for the CDM. The lessons learned from the AIJ Pilot Program regarding project eligibility and the definition of baselines can provide early guidance for determining the eligibility of proposed CDM projects. This should help conserve and channel scarce resources to project activities that ultimately will be certified by the CDM.<sup>[130]</sup> Figure 1 illustrates the key actors/stakeholders and relevant issues associated with the project identification and formulation step.

**Figure 1: Project Identification and Formulation.**



From the above list, it is clear that a broad base of capacity and skills are needed to support the effective screening, evaluation and approval process for proposed CDM projects. However, this is not an insurmountable requirement as many of the CDM programs described in the following Section on marketing have demonstrated. Many of these programs draw on expertise that is external to the responsible national agency to support their screening, evaluation and approval process.

## Project Eligibility Criteria

As discussed in earlier chapters of the book, Article 12 of the Kyoto Protocol stipulates four principal eligibility criteria for CDM projects. During project formulation, an important step is to establish that these criteria are met, they include:

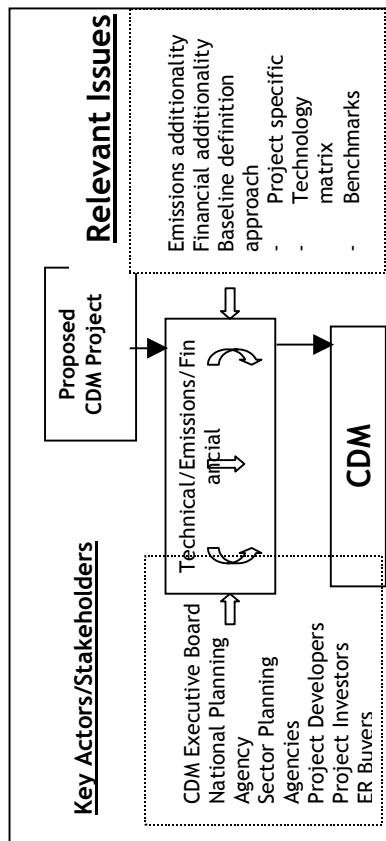
- Non-annex 1 Parties “will benefit from project activities resulting in CERS”.
- Projects must assist Non-annex 1 Parties “in achieving sustainable development and contributing to the ultimate objective of the Convention”.
- Projects must result in “real, measurable and long-term benefits related to the mitigation of climate change”.
- Projects must result in “reductions in emissions that are additional to any that would occur in the absence of the certified project activity”.

thus it is important that they are established properly and credibly at the outset.

The quantity of ERs that a potential CDM project activity can generate provides the basis for attracting the additional investments that may be needed to support the CDM project activity. Therefore, the development of a baseline for a CDM project lies at the heart of the validation process.

Additionally, the issue of macro-economic policies and regulations that inhibit the adoption of CDM type activities should also be carefully evaluated in order to minimize the potential for rewarding bad policies with CDM projects. Figure 2 identifies the key actors/stakeholders and the relevant issues associated with the process of baseline definition for CDM projects.

Figure 2: Baseline Definition.



## Project Baseline Formulation

The definition of the baseline, against which the ERs of a proposed CDM project are assessed, is a very important step in the CDM project cycle. A project baseline defines a level of expected emissions/carbon stores that is used to assess the mitigation performance of an alternative project. It is the basis from which the ERs for a CDM project activity must be measured. Baselines are also linked with the additionality criteria for CDM projects under the Kyoto Protocol<sup>[31]</sup>, and

<sup>[31]</sup> Article 12 of the Kyoto Protocol refers to “reductions in emissions that are additional to any that would occur in the absence of certified project activity.”

## Responsibility

The principal responsibility for defining the baseline associated with a specific project will lie with the project developer/investor. However, the underlying assumptions and data that support a baseline definition must be derived from national or international authorities. For example, the cost of baseline technologies, performance of baseline technologies, and emission/sequestration rates of baseline technologies will need to be derived from national data and ultimately validated at the national level. To the extent possible, the national authority for the CDM may establish the baseline parameters that are ultimately needed to help define project specific baselines. However, the guidelines for establishing these baseline parameters must derive from and be approved by an international CDM Executive Board in order to ensure a degree of consistency across host countries.

As part of the baseline study, an environmental examination has to be undertaken for each project, including trans-boundary impacts. If such an examination reveals that the impacts could be significant, then a full environmental impact assessment (EIA) is required. Such an EIA will solicit the opinions and concerns of local stakeholders and responsible government agencies and draw up an environmental action plan to mitigate the possible negative effects.

(1) project specific; (2) technology matrix; and (3) benchmarking.

1. ***The project specific*** baseline approach has been established and used extensively by the Global Environment Facility (GEF). It requires that for each proposed CDM project activity, a specific baseline project must be defined which provides the equivalent “normal” economic benefits, as does the proposed CDM project activity. The GHG emissions/storage of the baseline project are then estimated and compared against that of the proposed CDM project activity.
2. ***The technology matrix*** approach requires that a number of pre-defined default technologies are identified as the baseline technologies for a country or region and for a specified time (Hargrave, 1998). The baseline emissions for a proposed project would be equivalent to the emissions from the pre-defined default technology that is applicable to the project. The emissions from the proposed CDM technology would be compared against this baseline and the ERs credited to the CDM project would be the difference between the resulting baseline and the CDM project.
3. ***The benchmarking*** approach proposes that the emissions of a proposed CDM project would be compared to a “benchmark” emissions rate for the associated sector or sub-sector activity. For example, the baseline emissions rate for a new power plant would be set equivalent to a weighted average of the emissions rate of new power plants that are expected to be built in the absence of the CDM. This would be a “forward-looking” or projected benchmark. Alternatively, historic or “backward-looking” benchmarks could also be established on the existing and

## Approaches

There are several approaches that can be used to define a baseline, but for small-scale projects, they have to be simple, but effective. These vary in the degree of aggregation and level of accuracy. The growth of a market for ERs from the CDM requires that baseline definitions are consistent, transparent and relatively easy (i.e., not costly) to apply. Three methodologies for defining baselines that meet the above criteria and are presently gaining recognition, they are:

based on inadequate revenue for financial sustainability. A high estimate may oversell the benefits of the project. Due to the critical role that estimated emissions reduction potential can play in financing decisions for CDM projects, it is important that project developers are sufficiently knowledgeable about the procedures for estimating the emissions reduction potential of CDM projects.

## Monitoring Project Performance

To determine the actual performance and emissions reduction that is achieved by the project during implementation, project indicators will need to be closely monitored. A monitoring plan should be established that is transparent and internationally recognized in order for independent third party agents to verify the results. To ensure that appropriate monitoring plans are implemented for CDM projects, project proponents should be familiar with the requirements of the international standards for monitoring project performance. To enhance the capacity and knowledge on monitoring requirements for CDM projects, the CDM office should provide training workshops for project proponents on efficient and accepted methods of collecting the required project indicators.

## Reporting and Verification of Emissions Reduction

The monitored project indicators should be reported by project owners/operators for verification by independent third parties such as environmental auditing companies. The reporting requirements for CDM projects may include reporting of project boundaries, project inputs (e.g., fuel, other energy inputs), project emissions data, and methodologies used in collecting project data, among others.

past practice.

The approach used to determine an emissions baseline for a CDM project can also have consequences on the transaction cost of the project and in meeting emissions reduction verification requirements. Thus it is essential that a project developer select the best approach for a proposed project.

Project developers should also know how to properly document the establishment of baselines (including assumptions and methodologies used) in order to facilitate verification and certification of emissions reductions that will be achieved.

The importance of providing training about baselines cannot be overemphasized. Without basic knowledge of project baseline setting, project developers may expend significant time and resources in identifying and preparing projects, resulting in higher transaction costs and ultimately fewer projects being implemented.

## Quantification of Emissions Reduction

Closely linked with baseline setting is quantification of emissions reduction of proposed projects. When submitting a project design for validation as a CDM project with an estimate of the potential emissions reduction, the project proponent should clearly present the project baseline, the project boundaries, and the likely performance and emissions scenario of the project. The amount of emissions reduction that will be accrued by the proposed project is the difference between emissions in the baseline and proposed project.

An accurate estimate of the emissions reduction potential may also be critical to the financial feasibility of the project. A low estimate may unduly disqualify a potential project

Project owners/operators need to understand the reporting requirements of CDM projects in order to receive clean verification reports from independent agents. To ensure that CDM project results are verifiable, training workshops on the internationally agreed reporting requirements for CDM projects should be conducted as part of the capacity building program for CDM activities.

## Marketing CDM Projects

Successful CDM marketing involves ensuring an appropriate framework to expeditiously and cost-effectively meet international and national requirements. Requirements include those set by the framework of the KP, the host country and the implementing country. For the market in CDM projects to flourish, the rules of the CDM should be clear, transparent and workable. This is a key role for the CDM EB and/or National CDM boards. Then key players, recognizing the potential value of this market, will independently invest and undertake the front-end work of project identification and formulation needed to successfully develop CDM projects. By fostering the involvement of independent players, the CDM can avoid the need for expending public funds for project development, while relying on the marketplace to mobilize and apply funds to develop projects for the CDM.

## General Requirements

To successfully market international CDM transactions, the projects must be based on a number of fundamental principles, these include:

- Accomplishing agreed sustainable development that meets national objectives for the host country
  - Helps maximize the generation and supply of cost effective CERs
  - Provides reliable information and secure access for buyers of CERs
  - Provides legal recourse for both buyers and sellers of CERs
  - Meets the needs of a wide-spectrum of potentially diverse project types and proponents
  - Provides a real incentive for a broad base of investors to invest in CDM projects and not just attracts a limited band of green investors
  - Results in CDM projects that are additional to defined baselines.
- A number of operational elements need to emerge to support the development of a CER market, these include:
- Institutions/specialists/consultants that provide technical inputs for identification, formulation and development of CDM projects and project baseline
  - Institutions/banks/development agencies that provide monitoring, verification and certification services for CDM projects
  - Approved agents/agencies (*operational entities*) that are capable of providing monitoring, verification and certification services for CDM projects.
  - Markets and information sites where potential sellers and buyers can obtain the price and other relevant information relating to the supply of and demand for CERs.

- Brokers that bring potential buyers and sellers together to assist in the buying and selling of CERs and the recording of binding transactions.

Many of these elements have evolved in anticipation of CDM and market for CERs. Some of these elements are active in AJ transactions while others have operated in other related emissions trading markets. The rules governing the operation of these elements will derive from the rules established by the CDM Executive Board, the National CDM authorities and the Annex 1 Supervisory Committee etc.

## Legal Environment

A necessary but not sufficient pre-condition for attracting investments in CDM projects is a legal environment that fosters general investment. Certainly, an environment in which rules and regulations are not in place to protect and foster investments is discouraging for CDM initiatives. Additionally, environments in which internal and/or external investors have little or no legal recourse will also inhibit CDM project investments. Thus, favorable legal and regulatory investment environments should attract CDM initiatives and vice versa.

## Credibility and Transparency of the Process

Equally important to streamlining the screening, evaluation and approval process is maintaining the credibility and transparency of the entire process. Specifically, this means making the “rules” or criteria for screening, evaluation and approval publicly known in advance of applying them to proposed projects. Project proponents must have access to the criteria so that they can prepare their projects in accordance with the requirements of the criteria. Application

- of the criteria must be done in as uniform and consistent a basis as possible. All data and background calculations used in the process of evaluating a proposed project must be documented and made available for review by project proponents if requested. If a project is rejected, the reasons for its rejection must be clearly stated and substantiated so that the project proponent is either able modify the project to meet the required criteria or understands and accepts the reasons for the rejection of the project. If the process of screening, evaluation and approval is done in a manner that is not credible and transparent, project proponents of potential CDM projects will lose confidence in the process and will withdraw from participation in the development of potential CDM projects.

## Role of the CDM National Office

The CDM Office will also facilitate international investment and cooperation by developing a portfolio of pre-screened CDM projects that will be fast-tracked for validation and implementation. The CDM office will identify priority areas for CDM projects that meet national sustainable development criteria and may be cost effective in generating emissions reductions. The identified sectors, geographic areas, and potential projects will be promoted to interested project developers and investors.

The Office will also assist potential domestic and foreign investors in understanding the criteria required for approval and validation of CDM projects. In this respect, the CDM office will provide guidance to feasibility studies of potential CDM projects to ensure that the project baseline is appropriately established, emissions reductions are correctly estimated, and monitoring and reporting protocols meet verification and certification standards of the CDM Executive Board. An independent entity recognized by the international CDM

Executive Board will verify that the project baseline and emissions reduction reported meet agreed international criteria for CDM projects.

The CDM Office will also provide information on the performance of implemented projects as well as project opportunities to attract additional investments for CDM projects. The web page of the CDM Office will include links to climate change, energy, and other investment-related web sites.

## Existing CDM & JI Programs

Several investor countries have established AIJ/JI/CDM project evaluation criteria, as listed below. Countries with AIJ/JI/CDM experience may provide valuable examples for future CDM project marketing. Additionally, many multilateral, bilateral and private development funds have emerged and may be viable sources for CDM project financing, as will be discussed in Chapter 7. (I decided NOT to list the possible funds, or sources of financing, because there is a separate chapter in the book, Chapter 7: Carbon Finance by Jean Paul Moscarella, in which I imagine he will list these. However, I thought this would be useful.) A summary of the key evaluation criteria for both investor and host countries is presented in Table 3.1, these can serve as valuable criteria for designing a national CDM framework.

The Australian International Greenhouse Partnerships (IGP) Program aims to provide opportunities for Annex I and non-Annex I countries (as defined in the UNFCCC) to cooperate to reduce, avoid or sequester greenhouse gas emissions in a cost-effective manner.

The Canadian Joint Implementation Initiative (CJII) was launched in 1995 after the first Conference of Parties (CoP) to

the UNFCCC. The Canadian guidelines for Activities Implemented Jointly (AIJ) project criteria are based on Decision 5 of CoP 1.

**The Japan Program** for AIJ was launched under the Pilot Phase in November 1995. The evaluation criteria for AIJ projects under the Japan AIJ Program includes:

**The Netherlands Programme on Pilot Projects for Joint Implementation (PPP-JI)** was implemented by the Government of the Netherlands from 1995 to 2000. The PPP-JI program covered a broad range of projects that reduced GHG from sources and enhanced GHG sinks in both developing countries and Central and Eastern Europe.

**The Netherlands Emission Reduction Unit Procurement Tender (ERU-PT).** Based on experiences gained in the AIJ pilot program, the Netherlands issued a JI initiative Emission Reduction Unit Procurement Tender (ERU-PT) in May 2000. Through this tendering scheme, the Dutch government will buy high-quality emission reductions from JI projects in Central and Eastern Europe. The Netherlands is the first country in the world to enter the Joint Implementation carbon market as a buyer of emissions reduction units.

**The Norwegian AIJ Pilot Phase** activities were designed to catalyze opportunities for broad participation among interested Parties and relevant actors with the view to maximizing learning value. Private sector involvement is encouraged in pilot projects to provide further financial and technological resources and practical experience. The projects that qualify under the Norwegian AIJ program must clearly demonstrate that all objectives and criteria contained in UNFCCC Decision 5/CP.1 are met

**The Swiss AIJ Pilot Program** (SWAPP) criteria for AIJ projects include basic criteria approved by the Conference of the Parties to the UNFCCC in April 1995 (Decision 5) and SWAPP specific criteria outlined in Table 3.1.

**The United States Initiative on Joint Implementation (USJI)** was initiated in 1993 as part of the U.S. Climate Change Action Plan. The USJI is also the national program on AIJ under the UNFCCC. It supports the development and implementation of voluntary projects between U.S. and non-U.S. partners that reduce, avoid, or sequester greenhouse gas emissions.

**The United States' International Climate Change Project Fund** (ICCPF), administered by the International Utility Efficiency Partnerships, Inc. (IUEP), provides funding support to U.S. investor-owned utilities, their subsidiaries, and other investor-owned energy companies that are seeking to assess and implement specific projects to avoid, reduce and mitigate the climate impacts of greenhouse gas emissions in USAID assisted countries in Asia, Africa, and Latin America.

**The Prototype Carbon Fund** (PCF), managed by the World Bank, funds projects in the framework of Articles 6 and 12 of the Kyoto Protocol, or Joint Implementation and the Clean Development Mechanism, respectively. It will support projects directly and through participation in "local or regional carbon funds" that it will help to establish. However, even when the PCF participates in other carbon funds, its financing will be identified with specific projects that meet the agreed PCF project selection criteria and conform to the procedures of the PCF, which ensure high quality emissions reductions.

## **Host Country Criteria of AIJ/JI/CDM Projects**

**Costa Rica.** The Costa Rican Office on Joint Implementation (OCIC), authorized by Executive Decree, sets the objectives,

policies and criteria for the preparation, evaluation, and approval of AIJ projects.

**Czech Republic.** The Ministry of the Environment of the Czech Republic sets the criteria for JI projects.

**Poland.** The Government of Poland in 1994 established the Polish Secretariat for Joint Implementation. The Secretariat has responsibilities for communications, co-ordination, and review of Joint Implementation projects.

**Ukraine.** The Climate Change Initiative (CCI) is responsible for screening potential JI projects.

## **Summary of Key Project Evaluation Criteria of Investor and Host Countries**



# Chapter 6: Types of Projects

Coordinated by: Jimena Eyzaguirre

## Introduction

The Clean Development Mechanism is outlined in Article 12 of the Kyoto Protocol. Through the CDM non-Annex I countries benefit from the implementation of project activities that contribute to their sustainable development and generate certified emissions reductions. Annex I countries are allowed to purchase CERs to complement domestic reductions and limitations in compliance with their climate mitigation commitments. The criteria for potential CDM project activities are broadly delineated: CDM projects should have host country approval, produce qualitative, quantitative and long-term benefits and should generate additional emissions reductions to those in the absence of the said project<sup>132</sup>.

In theory, CDM projects have the common environmental objective of lowering the concentration of greenhouse gases in the atmosphere, which can be done by reducing or avoiding greenhouse gas emissions or sequestering carbon dioxide. The avoidance or reduction of carbon dioxide (or other GHG) emissions results from the substitution of a high emitting source with a lower or non-emitting source or through improvements in energy efficiency.<sup>133</sup> Sequestration refers

to the capacity to absorb carbon dioxide out of the air through the process of photosynthesis, thus decreasing the levels of atmospheric carbon dioxide.

In practice, defining the types of projects to be included in the CDM was not straightforward. In fact, there was much controversy regarding the inclusion of certain types of projects in the CDM, namely, land-use, land-use change and forestry, nuclear energy and large-scale hydroelectric energy, among others. This chapter includes summaries of various types of potential CDM project activities in which several topics are examined, such as economic and environmental feasibility and baseline calculations.

## Energy Generation

Written by: Evan Evans

### Renewable Energy

Renewable energy projects can result in numerous benefits. Projects that supply renewable energy for grid use can reduce overall costs as well as greenhouse gas emissions. Large-scale generation for utility grids is a suitable application for RE. Such generation is typically for supply to the grid on a long-term, commercial basis, essentially as an independent power producer (IPP). The most common applications of RE for grid-connected power are mini or small hydro, wind farms (multiple wind turbine generators in one location), and surplus electricity from biomass cogeneration.

### Fossil-Fueled Cogeneration

Like RE electricity-generation projects, fossil-fueled cogeneration can reduce overall energy costs and also deliver reductions in GHG emissions. Whereas conventional electricity generation plants are typically about 35% efficient

<sup>132</sup> UNFCCC, The Kyoto Protocol - to the Convention on Climate Change, 1997.

<sup>133</sup> Figueiras, C., et al. "Implementing JI/AlJ: A guide for establishing joint implementation programs". CSDA. 1996

in the conversion of fossil fuel into electricity, cogeneration plants achieve overall efficiencies of about 45% - 70% by capturing waste heat from the fuel combustion process and putting it to productive use.

#### Carbon Offset Analysis Methodology

The CDM requires carbon offsets based on certified emission reductions (CERs) that are clearly additional. This criterion demands that selected projects have a credible, quantifiable and verifiable baseline of emissions, from which reductions can be measured and verified. The baseline represents the emissions from electricity generation “that would occur in the absence of the certified project activity,” i.e., the renewables projects. The baseline scenario can be summarized as least-cost electricity-supply development, without special regard for environmental protection.

The quality of CERs from an offset project depends on the credibility of the project’s addtionality, which requires a credible, quantifiable and verifiable baseline of emissions. Thus, “the baseline describes the GHG emissions associated with a counterfactual scenario that would prevail without the JI or CDM intervention and with which actual emissions can be compared”<sup>134</sup> (World Bank 1999a). The credibility of the baseline is crucial, as this is the key to the acceptance of a CDM project’s CERs as additional under the UNFCCC.

The baseline case should be the same for all electric generation projects proposed. This does not mean, however, that the baseline generation source, or the corresponding emission intensity, should be constant. Rather, the baseline energy sources can be expected to have different output profiles as a function of time (seasonally or even hourly),

causing variations in the baseline emission intensity. In addition, the baseline source that the project replaces could vary over the lifetime of the project, or it could depend on when the project enters into service. These variations can also affect the baseline emission intensity.

Net emission reductions (ERs) for renewable energy or cogeneration projects must be compared on the basis of the carbon content of the fossil fuel replaced. Thus, the principal parameters that determine the ERs for such energy projects are the baseline carbon emission intensity, the project emissions (if any) and the projects’ energy production rates, once the baseline has been identified.

The ERs from each renewable energy or cogeneration project is proportional to the energy produced and the relevant baseline carbon intensity value, which is determined from the carbon content of the fossil fuel replaced in the baseline case. The two values that must be quantified and measured in order to generate CERs are the baseline carbon intensity and the electric energy produced by the renewable energy or cogeneration projects.

## Energy Efficiency

Written by: Evan Evans

Energy efficiency projects can also result in numerous benefits. By using energy more efficiently, an organization’s vulnerability to fluctuations in energy prices is reduced whereas its cost-effectiveness is improved and the environmental impacts of displaced energy consumption are avoided. Frequently entities must choose between investing in energy efficiency or energy supply. There are numerous issues surrounding these decisions.

<sup>134</sup> World Bank, 1999a. “Baseline Methodologies for PCF Projects”, The World Bank, Washington, D.C., October, 1999.

In developing countries, energy use is expected to triple in the next 30 years due to population growth and economic expansion. Annual electricity sector investments would have to double to provide supplies to meet projected growth rates.

Investing in supply is a capital-intensive undertaking, usually paid primarily in foreign exchange adding currency risk to the investment consideration. Already a large part of public investment budgets, additional investments in supply can have difficult financial consequences and damaging environmental impacts. Even if the money is available, it is difficult to expand supply capacity quickly.

Energy efficiency reduces the need to build additional capacity by reducing energy demand. It decreases the environmental impacts of increased generation through avoided demand. Energy efficiency decreases life cycle costs to consumers while also reducing system-wide capital costs. Efficiency can be achieved through improvements to a variety of systems including HVAC, motors, drives, lighting, and controls. Projects can be funded via grants, low-interest loans, market-rate loans, leases, or performance contracts from funding sources including Energy Services Companies (ESCOs), utilities, capital markets, equipment vendors, or development banks. Energy cost savings result in cash flows for energy efficiency projects. Direct project costs include design, installation, and maintenance of the energy efficiency measures.

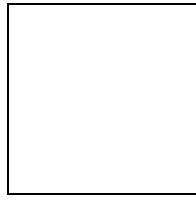
Energy efficiency projects tend to be on a much smaller scale than generation projects, occurring at numerous sites with highly engineered technology. The risks involved in an energy efficiency project include the possibility that actual measured savings may not meet projections, credit risk, currency risk, and the potential for facility operating changes.

There are a number of environmental costs associated with energy use. Electricity generation releases several pollutants into the air including air particulates that cause health problems and impair visibility, sulfur dioxide ( $SO_2$ ) and nitrogen oxides ( $NO_x$ ), which cause acid rain, and greenhouse gases that contribute to climate change. Additionally, generation causes water pollution and waste accumulation through ash, sludge, and radioactive waste, depending on the type of generation facility. These environmental impacts and costs are mitigated by reduced energy consumption through energy efficiency projects.

### Carbon Offset Analysis Methodology

An energy audit of the targeted facility is the first step in understanding how it currently uses energy. The purpose of an audit is to identify and prioritize cost-effective energy efficiency measures. Carbon emissions reductions that result from investments in energy efficiency can be directly calculated from the amount and type of energy savings that the efficiency project delivers.

The objectives of the carbon management analysis are to:



Quantify the energy savings that would result from the energy efficiency measures.

In the case of on-site fuel consumption, the carbon content of the specific fuel is the basis for determining the reduction in carbon emissions delivered by the efficiency project.

Determine the quantity of carbon emissions saved based on the incremental energy savings.

Once the energy efficiency analysis has quantified energy savings, carbon emissions balances are calculated for each carbon management measure. Estimates of net carbon emission reductions are quantified with respect to the emissions baseline, on the basis of the carbon content of fuels consumed and the carbon intensity of displaced grid electricity.

The baseline represents the emissions from fuel consumption or electricity generation “that would occur in the absence of the certified project activity,” i.e., the energy efficiency measures. Having successfully established the baseline, the developers must analyze similar models of the prospective energy efficiency measure. The models are used to quantify the approximate reduction in energy consumption for each efficiency improvement measure relative to the baseline.

The developer analyzes carbon emissions for the measures based on whether the fuel is consumed on-site or electricity is purchased from the local electric utility. In the latter case, calculation of carbon emissions reduction uses the emission rate in mtC/MWh of the least-efficient peaking fossil fuel-fired power plant in the power sector. The resultant carbon intensity is multiplied by the electricity saved in order to calculate a carbon emissions reduction resulting from the energy efficiency measures.

## Energy Efficiency Measures

There are nearly as many energy efficiency measures as there are different ways in which energy is consumed. A few of the common energy efficiency measures suitable for CDM projects are:

Measures	Description
Boiler oxygen trim controls (commercial buildings or industrial plants)	Increases combustion efficiency, thus decreasing fuel (oil, coal, or natural gas) consumption
Heating crude oil (oil production and oil pipeline facilities)	Reduces oil viscosity using heat recovered from gas turbines & engines, thus reducing required pumping energy
High efficiency cooling equipment (commercial buildings and industrial facilities)	Efficiency improvements of industrial process chillers and air conditioning systems
High efficiency electric lighting (commercial buildings and industrial facilities)	Upgrade to premium efficiency lighting equipment
Premium efficiency motors (industrial facilities)	Replace older electric motors with new premium efficiency motors
Synchronous belt drives (commercial buildings and industrial facilities)	Improve the overall efficiency of electric motor drive-train system
Variable speed drives (commercial buildings and industrial facilities)	Places controllers on the motors that adjust motor speed to track variable loads
Waste heat recovery (industrial facilities)	Capturing heat from industrial processes, combustion fuel gases, or cooling equipment condensers and putting it to

Energy's (DOE) Argonne National Laboratory, one of the most advanced research organizations in the world with respect to the GHG benefits of AFVs, conducted a study showing that electric vehicles, hybrid-electric vehicles, compression ignition, direct injection vehicles, and E85 (85 percent ethanol and 15 percent gasoline) flexible-fuel vehicles can reduce fuel-cycle GHG emissions by 80%.<sup>137</sup> This study demonstrates that certain types of AFV technologies may be considered applicable for international greenhouse gas (GHG) emission reduction projects undertaken as part of the UN Framework Convention on Climate Change (UNFCCC), including the pilot phase of Activities Implemented Jointly (AIJ) and the Clean Development Mechanism (CDM) of the Kyoto Protocol.

Automated control buildings (commercial and industrial facilities)	economical use	Computerized systems automatically adjust the operation of energy-consuming equipment to reduce energy usage
Ultrasonic humidifiers (industrial facilities)	serve precise humidity control requirements that replace electric resistance or fuel-fired humidifiers	Serve precise humidity control requirements with ultrasonic devices that replace electric resistance or fuel-fired humidifiers

## Transportation

Written by: Julie P. Doherty

The transportation sector is the fastest growing source of greenhouse gas emissions (GHGs) in the world. As nations grow wealthier, their people buy cars at increasing rates. Motor gasoline consumption yields about one-fifth of all U.S. GHGs alone with one gallon of motor gasoline consumed emitting 19.6 pounds of carbon dioxide and one gallon of diesel emitting 22.4 pounds of carbon dioxide.<sup>135</sup>

Mounting evidence indicates that a decrease in carbon emissions can be achieved by replacing traditional gasoline and diesel-powered vehicles with certain applications of alternative fuel vehicles (AFVs).<sup>136</sup> The U.S. Department of Energy's (DOE) Voluntary Reporting of Greenhouse Gases Form Instructions, Energy Information Administration, U.S. Department of Energy, 2000, [www.eia.doe.gov](http://www.eia.doe.gov).

<sup>135</sup> Alternative fuels are substantially non-petroleum and yield energy security and environmental benefits. DOE currently recognizes the following as alternative fuels: methanol and denatured ethanol as alcohol fuels (alcohol mixtures that contain no

that controls that adjust the ignition, direct injection vehicles, and E85 (85 percent ethanol and 15 percent gasoline) flexible-fuel vehicles can reduce fuel-cycle GHG emissions by 80%.<sup>137</sup> This study demonstrates that certain types of AFV technologies may be considered applicable for international greenhouse gas (GHG) emission reduction projects undertaken as part of the UN Framework Convention on Climate Change (UNFCCC), including the pilot phase of Activities Implemented Jointly (AIJ) and the Clean Development Mechanism (CDM) of the Kyoto Protocol.

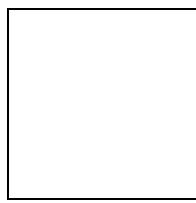
As AFV use grows, major automobile manufacturers and governments are also researching new types of clean transportation technologies. Other advanced technologies with the potential for use in CDM projects include hydrogen fuel cell and "clean diesel" vehicles. These technologies have the medium to long-term potential to be used in addition to or as replacements for the technologies listed above.

<sup>137</sup> Wang, Michael Q., "Fuel-Cycle Greenhouse Gas Emission Impacts of Alternative Transportation Fuels and Advanced Vehicle Technologies," Transportation Research Record 1664, Paper No. 99-1327.

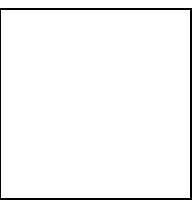
<sup>138</sup> A hydrogen fuel cell vehicle works by converting the chemical energy of hydrogen and combining it with oxygen to produce electricity, heat, and water. "Clean diesel" fuel usually means low-sulfur diesel.

There is currently little international experience with GHG emission reduction projects using transportation technologies. Of the 125 AIJ projects reported to the UNFCCC, there are 108 energy projects, 16 forestry projects, and 1 transportation project. There are currently no Clean Development Mechanism (CDM) projects using transportation technologies, though there is active interest on the part of public and private sector participants in the Clean Cities Santiago Program in Santiago, Chile in creating a CDM project using natural gas vehicle (NGV) technologies.<sup>139</sup> As of 1998 there were 70 transportation related GHG emission reduction projects listed with the U.S. Department of Energy's 1605b Voluntary Reporting Program, a small number compared to the 424 electricity generation, transmission, and distribution projects reported that same year.<sup>140</sup>

There are various reasons for the lack of GHG emission reduction projects including CDM projects in the transportation sector worldwide. The primary reason includes a lack of sufficient technical information on issues including:



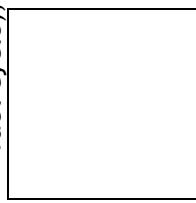
how to quantify and monitor and verify  
(M&V) potential emission reductions;



<sup>139</sup> Clean Cities is sponsored by the U.S. Department of Energy (DOE) and is designed to encourage the use of alternative fuel vehicles (AFVs) and the implementation of supporting AFV infrastructure. By encouraging AFV use, the Clean Cities Program helps to achieve energy security and environmental quality goals on local, national, and international levels. Unlike traditional command-and-control programs, the Clean Cities program takes a unique, voluntary approach to AFV development, working with coalitions of local stakeholders to help develop the AFV industry and integrate this development into larger planning processes. There are currently 77 Clean Cities in the United States, 3 border programs with the cities of El Paso, Texas and Juarez, Mexico; Detroit, Michigan and Toronto, Canada; Grand Forks, North Dakota and Winnipeg, Canada; and a program in Santiago, Chile.

<sup>140</sup> The 1605b Voluntary Reporting of GHGs Program was designed by the U.S. Government to help U.S. companies measure and record the actions taken to reduce greenhouse gas emissions or to increase carbon storage in soil or plants. The voluntary reporting program provides an opportunity for U.S. companies to gain recognition for the good effects of your actions-recognition from customers, shareholders, public officials, and the Federal government. Finally,

which emission sources to include in estimation of emission reductions (tail-pipe versus full fuel cycle); and



transaction costs of CDM transportation projects.<sup>141</sup>

The question of how to quantify potential emission reductions is significant because unlike other advanced technologies with

the reports, can contribute to the growing body of information on cost-effective actions for controlling greenhouse gases.

<sup>141</sup> Science Applications International Corporation (SAIC), "Case Study: CNG Taxis, The Republic of Clean Cities," Presented at the 6<sup>th</sup> National Clean Cities Conference, San Diego, CA, May 10, 2000.

a set location and owner, transportation technologies are normally owned on an individual-user, small, medium and/or large fleet basis. Just as in the case of other advanced technologies, the availability and quality of GHG emission reductions for the technology depend on the maintenance of the equipment. Therefore, it is extremely difficult to monitor and verify (M&V) potential GHG emission reductions to be included in a CDM project due to the dispersed ownership and locations and consequent maintenance of the technologies.

There is also significant debate with respect to which emission sources to include in the estimation of emission reductions (tail-pipe versus full fuel cycle). Though the most accurate measurement of potential GHG emission reductions for the transportation sector would include looking at the full fuel cycle of switching to a specific technology,<sup>142</sup> the cost of this type of data collection according to organizations such as the U.S. based Gas Research Institute (GRI), would be prohibitive.<sup>143</sup> Due to the fact that most of the data on GHG emission reductions from certain transportation technologies are based only on tail-pipe measurements, there is concern that true GHG emission reductions for this sector are not currently measured properly.

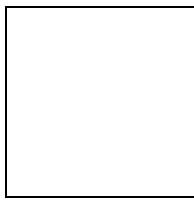
The final and most significant issue for the creation of CDM projects using AFVs is that of transaction costs. As stated above, the creation of GHG emission reduction projects using transportation technologies differ inherently from GHG

<sup>142</sup> An example could include looking at the decrease in emissions from natural gas which is transported by pipeline as opposed to gasoline which is at times transported by vehicle and also goes through a refining process.

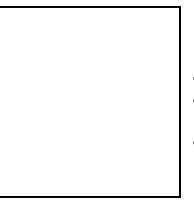
<sup>143</sup> Gas Research Institute (GRI), "Natural Gas Vehicles and Greenhouse Gas Emissions," Presented at the 6<sup>th</sup> National Clean Cities Conference, San Diego, CA, May 10, 2000.

emission reduction projects using other energy technologies in that the ownership, location, and maintenance of the transportation technologies are dispersed. The cost of ensuring uniform maintenance of all vehicles in a GHG emissions reduction and/or CDM project using transportation technologies is proportionately much higher than that of other energy technologies in that one is dealing with individual vehicle owners/operators and vehicles.

There is the potential for an increase in the number of CDM projects in the transportation sector in industrialized and developing countries with consideration of the following factors:



an increase in research and development (R&D) with respect to tail-pipe and full-fuel cycle GHG emission reductions from transportation projects;



development of standard M&V methodologies with broad international acceptance for dispersed projects such as those in transportation where vehicles in the project are not stored, parked, and/or serviced in the same location; and

of CO<sub>2</sub> for trapping heat in the atmosphere over a time frame of 100 years. No other GHG has increased in concentration as much as methane over a 100-year horizon.

more training/capacity building on how to create a CDM project using transportation technologies in order to reduce the transaction costs of the project as well as familiarize project developers, national climate change entities, and other public and private sector representatives of the potential for GHG emission reductions in the transportation sector.

The Clean Development Mechanism (CDM) provides a market-based mechanism to address GHG emission reductions resulting from the transportation sector in industrialized and developing countries. Though the number of GHG emission reduction projects in the transportation sector worldwide is increasing, there is significant additional R&D and training necessary to fully achieve the potential for GHG emission reductions in the transportation sector.

One of the main sources of methane emissions are ruminant animals (buffalo, deer, goats, sheep, and cattle), which account for 80 million tons of CH<sub>4</sub> emissions per year, corresponding to 22% of global methane emissions. These animals have a unique digestive system whose rumen converts otherwise unusable materials into nutritious food and fiber. This process, referred to as enteric fermentation, produces methane as a by-product, which is exhaled and eructated by the animal. Methane emissions in fact, represent an inefficient use of dietary energy.

Developing countries have particularly high levels of ruminant methane emissions per unit of product. Deficient grazing management, poor diets, poor health care and non-favorable breeding practices, among others, have been identified as the main factors contributing to greenhouse gas emissions from cattle. Researchers around the world have been experimenting with nutritional and/or genetic modifications, among others, aimed at reducing emissions from enteric fermentation in cattle and from anaerobic fermentation of cattle manure. These emissions reduction techniques contribute not only to mitigate CH<sub>4</sub> and other GHGs but they also help to enhance animal productivity.

## Ruminants

Written by: Patricia Vasquez

Current efforts in greenhouse gas (GHG) mitigation concentrate on carbon dioxide (CO<sub>2</sub>). However, new scientific studies<sup>144</sup> are beginning to put more emphasis on the deleterious effects of other GHGs. They are especially focusing on methane (CH<sub>4</sub>), which has 21 times the potential

Since methane emissions vary according to the composition of food intake, experiments are mainly geared towards the development of diets that promote lesser rates of emissions. Food supplementation is an option, as well as alternative pasture compositions favoring increased digestibility rates. Together with food supplementation and adequate pasture management, control of diseases, genetic improvement, an increase in pregnancy rates and intervals

<sup>144</sup> Hansen, J., Sato, M., Ruedy, R., Lacis, A., and Oinas, V., (2000), "Global warming in the twenty-first century: An alternative scenario"

among births would also contribute to reduced emissions and increased productivity.

Examples of current research throughout the world include experiments in Australia using an antimethanogenic compound that completely inhibits methane production. In Costa Rica, researchers are tracking variations in daily methane emission levels from cattle fed on different grass species. In dairy cattle, milk efficiency and CH<sub>4</sub> emissions were shown to be directly related to the quality and intake of forage.<sup>145</sup>.

In the United States, there are programs in place to inform producers about the benefits of controlled grazing, also known as management-intensive grazing (MIG). MIG consists of subdividing large pasture sites into smaller paddocks where cattle are stocked and moved according to forage availability and nutritional needs<sup>146</sup>. In India, a project in which buffalos are fed molasses-urea supplementation is resulting in an increase in productivity, along with reduced methane emissions on a per-unit of product basis<sup>147</sup>.

In Latin America, Argentina is the most striking case of methane emissions, with 15 MMTC of methane stemming from its 50 million cattle. This corresponds to 35% of total national greenhouse gas emissions. **There is a pilot project**

<sup>145</sup> Second International Methane Mitigation Conference, June 18-23, 2000, Novosibirsk, Russia. Presentation Abstracts.

<sup>146</sup> United States Environmental Protection Agency, Methane Energy Programme. <http://www.epa.gov/outreach/>

<sup>147</sup> Second International Methane Mitigation Conference, op cit.

<sup>148</sup> Argentina Greenhouse Gas Inventory for 1999 (1999), Proyectos Metas de Emision Arg/99/003 - PNUD - SRNyDS; Secretaria de Recursos Naturales y Desarrollo Sustentable, Buenos Aires; Revision of the First National Communication - Republic of Argentina (1999),

under development<sup>149</sup> for that country within the JI/CDM framework aimed at identifying specific technologies and management practices to reduce methane emissions and improve production efficiency. The project would also allow for the transfer of innovative methane measurement technology, thus adding to the accuracy of livestock emissions estimates, and the quantification of the impacts of implementing improved technologies and management practices in Argentina.

## Waste Management

Written by: Edward Hoyt

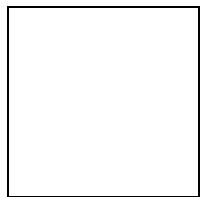
Projects involving changes in the management of municipal wastes offer opportunities to reduce emissions of methane (CH<sub>4</sub>), an especially potent greenhouse gas, as well as to displace consumption of fossil fuels that generate CO<sub>2</sub>. Although CH<sub>4</sub> emissions represent a very small part of aggregate emissions to the atmosphere, the magnified warming potential of methane (21 times that of CO<sub>2</sub>) means that mitigation projects offer correspondingly greater benefits. When these benefits are considered together with the significant local environmental benefits of such projects, and the potential for offsetting consumption of fossil fuels, projects in the waste management sector may be particularly attractive. At the same time, a variety of social and economic issues may complicate the implementation of such projects, making it especially important to have solid political support in order to implement them.

Segun la Convencion Marco de las Naciones Unidas sobre el Cambio Climatico; Buenos Aires.

<sup>149</sup> The project is sponsored by the Center for Sustainable Development in the Americas (CSDA)

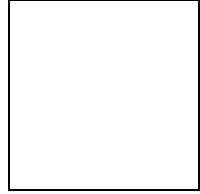
## Energy production and/or recovery of energy content of waste streams

Reductions of CH<sub>4</sub> emissions and displacement of CO<sub>2</sub> emissions from waste management projects occur as a result of the following physical linkages and dynamics:



**Solid waste - methane.** Solid waste landfills generate CH<sub>4</sub> as the natural by-product of decomposition of organic material in the solid-waste stream. In developing countries, solid-waste generation tends to include a higher percentage of organic material, as opposed to plastics, metals, glass, paper and other types of materials. Accordingly, the potential for obtaining CH<sub>4</sub> gas from landfills located in population centers in developing countries is significant. However, the volume of extractable landfill gas depends on the extent to which a landfill is adequately sealed and managed to avoid gas seepage directly into the atmosphere and ensure gas quality over time (landfill gas is typically a mix of CH<sub>4</sub> and CO<sub>2</sub>). At the same time, safety considerations require that the gas generated in the landfill be handled properly, to prevent the formation of dangerous concentrations that can lead to explosions and/or poisoning; some techniques and technologies for waste management are intended to limit the potential for gas formation.

**Human/animal/agricultural waste - methane.** Methane gas is also an important by-product of chemical processing of human and animal wastes, and different types of agricultural wastes, especially those containing high levels of moisture. Gas produced in biogas fermentation, in gas capture and processing units located at agribusiness facilities, in municipal wastewater treatment facilities and even in residential areas may be captured and processed for use.



**Methane - fossil energy displacement.** Methane gas extracted from landfills or produced from animal or vegetable waste is a high-quality fuel, virtually identical in terms of chemical composition to natural gas. Depending on the CH<sub>4</sub> content of the landfill gas extracted, landfill gas extraction projects make it possible for most facilities to generate fuel for small generation units to produce electricity and/or steam for various uses. To the extent that the power and thermal energy produced in this way is used in replacement of electricity produced by fossil-fired generation facilities, or in place of fossil or biomass fuels for heating, cooking or thermal energy requirements in production processes, such projects yield reductions of uncontrolled methane emissions

and CO<sub>2</sub> emissions from fossil fuel combustion. The exact degree to which the project reduces total GHG emissions will depend on the type of fuel used for energy production prior to switching to landfill or waste gas, and the extent of uncontrolled methane emissions prior to the project.

stream, and is directly related to the presence of high-value recyclable wastes. Accordingly, cities in developing countries tend to generate solid waste with relatively low energy contents, whereas waste from cities in industrialized countries tends to offer higher calorific values.

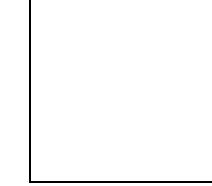
## Socio-economic feasibility of energy production or recovery from waste streams

*Recoverable energy content of solid waste - fossil energy displacement.* In addition to methane production from landfills and other facilities where human, animal or agricultural wastes are generated, non-biodegradable solid wastes deposited in landfills offer recoverable energy content. This may be exploited in either of two ways: first, by using the waste as fuel in waste-to-energy facilities, thereby displacing other energy resources, as is often the case in developed nations; or second, through recycling certain high-value solid waste materials, such as steel, aluminum, glass, plastic and paper. Recycling avoids the energy consumption required to produce virgin materials, albeit to a greater or lesser degree depending on the material in question (aluminum offers substantial savings in this respect). The extent to which waste-to-energy facilities and recycling programs and businesses yield significant emissions reductions depend on the characteristics of electricity production on the grid, as well as for thermal energy production, and the amount of electric and thermal energy production embodied in recycled materials. The recoverable energy content tends be inversely proportional to the moisture content of the solid waste

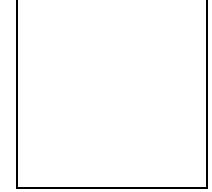
The feasibility of implementing projects involving the recovery or production of methane gas for use as fuel, or the recovery of energy content in solid waste through direct use as fuel or recycling, will in turn depend on a series of socio-economic linkages and dynamics. The extent to which these factors inhibit the implementation of projects in the waste management area varies significantly from nation to nation and may even vary from city to city within a given country.

*Stringency of the application of environmental and sanitary regulations.* A regulatory driver is vital for the political support that many waste management projects require, especially when significant public infrastructure investment is required. National environmental and sanitary standards often provide the political justification for local government agencies to undertake such projects, such as modern sanitary landfills and wastewater treatment plants. Typically, some public role is necessary due to the fact that some projects, such as

wastewater treatment plants, are not likely to be economically viable without public investment unless the full costs of building, financing and operating the plant may be recovered from ratepayers. This is unlikely in most developing countries and in many developed nations as well. Generally, some level of government participation in financing waste management projects is considered desirable given the social benefits such projects provide.

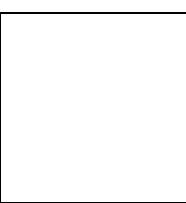


*Availability and cost of alternative sources of electric and thermal energy.* The value of the energy produced or recovered from waste streams is likely to be an important determinant of the economic viability of a given project. In countries where cheap sources of electric and thermal energy are available, sales of power from landfill gas projects or waste-to-energy projects may not be enough to justify investment in the projects - unless, of course, other collateral benefits yield sufficient economic value or social desirability to justify the implementation of the project.

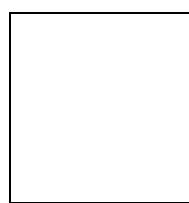


*Social and economic opportunity costs of recovering energy content of waste streams.* Important social networks have evolved around the

exploitation of solid waste streams, making changes to the management of solid waste politically very difficult. This is especially true in developing countries, where entire communities of individuals, often comprising a recognizable social class, may base their livelihoods on the recovery of economically valuable materials from municipal solid waste. These communities can achieve significant political and financial influence in some countries, such as the *pepenadores* in Mexico City or the *zabbal*<sup>10</sup> in Cairo, making it extremely difficult to displace them in favor of a technically more suitable landfill or an industrialized waste-to-energy facility. At the same time, the resource recovery that sustains these communities provides a clear demonstration of the economic value of materials that also have high levels of embodied energy content. Developing countries are not alone in facing these important social issues; waste hauling is a lucrative business in major developed world cities as well, and efforts to alter the patterns of management may result in opposition from powerful vested interests - as in the case of mafia ties to the business in New York City. Lastly, there may be trade-offs between different technological approaches to waste management that could limit the potential for exploitation of energy produced using the waste stream or recovered from it. A case in point is the use of compaction technologies for landfills. Although the compaction process helps address safety considerations and space limitations, it creates an anaerobic environment that prevents methane gas formation.

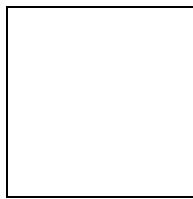


*Allocation of investment resources in urban infrastructure and public services.* Cities and municipalities with limited investment budgets may find that competing demands for budget resources make it extremely difficult to invest in projects or extensions of existing projects that go beyond current, minimal requirements. In developing countries, where basic infrastructure is often lacking or only beginning to be constructed, public officials may opt for more limited projects in the waste management area to ensure that resources are available for other badly needed investments. Clearly, the possibility of encouraging private investment or generating carbon credits from a waste management project would be especially attractive in such circumstances.



*Opportunities for private investment in infrastructure and public services.* Limitations on public financial resources need not be an insurmountable obstacle to the implementation of projects in this area, provided that there are adequate mechanisms permitting private investors to get involved. This may well require special legislation, since private investment has frequently been restricted by laws on private or foreign investment in public services, special arrangements governing the

procurement of goods and services by the government, licensing and other special requirements. Many developing as well as developed countries have given greater latitude for the private provision of public services in the last two decades, and these experiences offer numerous lessons on how such projects may be implemented. Carbon credit sales may be incentives for private sector investment as well.



*Public opposition to specific types and locations for public or private infrastructure development.* A very important factor hindering the implementation of waste management projects may be public opposition. This has been a fact of life for public officials and companies in the waste management business in industrialized nations for many years, but it is also something that many developing nations have begun to experience. Although public opposition may be linked to private economic interests that may be affected by a given project, it is more likely that in most cases the major problem is inadequate communication with local communities. A well designed and implemented communication program, including the possibility of visits to the facility once in operation and the establishment of a regular community outreach program, as well as investments in schools or other community needs, may make the difference between strong local support and opposition.

*Desirability and valuation of collateral benefits and by-products of waste management projects.* These issues are especially important in siting facilities, as well as in justifying public expenditure on projects with or without private cooperation. The valuation of collateral benefits may help ensure that the economic evaluation of a project meets investment criteria, and may result in the registration and sale of carbon credits from waste management projects. In addition, certain types of projects may yield useful products for use in the agricultural sector (organic fertilizers), or industrial processes (chemicals such as ammonia).

Since waste management activities of some scale are indispensable in even the smallest settlements, industrial facilities, and agribusiness facilities where large numbers of animals are concentrated, it is impossible to implement new waste management projects without displacing or affecting existing arrangements for handling waste. Where projects are undertaken by or on behalf of the public sector, the process of implementing a project becomes a preminently political process. Hence, project proponents must consider the necessary political process to implement projects that are feasible from a technical and economic point of view.

## Conclusion

## References

---

- Wang, M.Q. "Fuel-cycle greenhouse gas emission impacts of alternative transportation fuels and advanced vehicle technologies." *Transportation Research Record* 1664, Paper No. 99-1327.
- World Bank, 1999a. "Baseline Methodologies for PCF Projects", The World Bank, Washington, D.C., October.
- E4, Econergy International Corporation, 2000. "Fund for Renewable Energy Resources: Procedures for Baseline Analysis and Quantification of Net Emissions Reductions from Renewable Energy Projects in Costa Rica", Boulder, August.
- Econergy International Corporation, 2000. "Energy Efficiency and Renewable Energy Best practices", Boulder, August.
- Energy Information Administration, U.S. Department of Energy. Voluntary reporting of greenhouse gases form instructions. Retrieved September, 2000 from the World Wide Web: <http://www.eia.doe.gov>
- Hansen, J., Sato, M., Ruedy, R., Lacis, A. and Oinas, V. "Global warming in the twenty-first century: An alternative scenario." *Proceedings of the National Academy of Sciences of the United States of America* August 29, 2000: 9875-9880.
- Natural gas vehicles and greenhouse gas emissions. Sixth National Clean Cities Conference. Gas Research Institute. San Diego. May 10, 2000.
- Second International Methane Mitigation Conference. June 18-23, 2000) Presentation abstracts. Novosibirsk, Russia. Retrieved September, 2000 from the World Wide Web: <http://www.ergweb.com/methane/index.html>
- United Nations Framework Convention on Climate Change. The Kyoto Protocol - to the Convention on Climate Change. Kyoto, Japan. December, 1997.
- United States Environmental Protection Agency. Methane energy programme. Retrieved September, 2000 from the World Wide Web: <http://www.epa.gov/outreach/>

# Chapter 7: Carbon Finance

Written by: John Paul Moscarella  
Econergy International Corporation

## Abstract

Generally speaking, finance refers to the study of a system that involves the circulation of money and credit, the making of investments, and the provision of banking facilities. The science behind finance includes managing funds and obtaining or raising capital. There are 10 different types of finance that are discussed in this paper. These types of finance include: Corporate, Project, The Financial "Lock Box" Model, Venture Capital, Letters of Credit, Insurance and Guarantees, Factoring, Leasing, Financial Intermediation and finally Bond Markets. Within each section of finance there is an example provided for a better understanding of the concepts described.

Finally, a brief section on carbon transactions and volumes is provided, in order to illustrate some of the market activity to date.

## Introduction

The concept of "Carbon Finance" is demonstrated with three models. The first model is the Carbon Contract with performance Clause. A Carbon Contract is similar to a forward contract, as an agreement is made today for an obligatory exchange of funds in the future (Levich, 63). However, in the case of a carbon contract, carbon offsets are being exchanged rather than funds. Just as a forward contract secures the buyer against any potential risk of non-delivery from the seller, a carbon contract secures the buyer

against non-delivery of carbon offsets from the project sponsor or seller.

A second model involves an options market for Certified Emissions Reductions (CERs). The basic concept of using options to trade securities may also be applied when considering CERs. An option is the right, but not the obligation, to buy or sell a fixed quantity of an underlying financial asset or commodity at a given price on or before a specified day (Levich, 393). All options may be either puts or calls. A put option gives the owner the right to sell the security while a call gives the owner the right to sell an asset or commodity. The price written in the contract for which the option may be bought or sold is called the strike price and the price paid for the option is called the option premium.

These basic concepts of options trading for assets and commodities may be applied when considering trading options for carbon offsets. When considering industrial efficiency and carbon trading, it is important to keep efficiency in mind. In order to trade carbon offsets in an options market, the volume or tons of carbon should be considered. When the firm decides an efficient approach to reducing carbon is to sell carbon offsets, a strike price will be established. Then, the value of the put or call will be determined based on the strike price. The date of delivery will be agreed upon by both the buyer and seller.

The last type of model discussed in this paper involves swaps. In finance, common types of swaps are interest rate swaps. Two parties agree to exchange or swap interest payments on a specific amount of principal (Madura, 463). This same principal may be applied when considering swaps for emissions trading. There are two types of swaps involved

#### **Box 1: Example of Corporate Finance**

In 1990, Rain Forest Aerial Tram (RFAT) had developed an idea for a potentially pioneering ecotourism project in Costa Rica. The small private firm envisioned a tram transportation system located within an extremely delicate rain forest ecosystem. The idea was to bring eco-tourists on a two-hour journey via a modified ski lift through the canopy of the rain forest, one of the richest ecosystems in the world. The project was perceived to have a potentially high impact on ecotourism and rain forest-safe technology, as well as demonstrating a concrete, profitable way to conserve the rain forest. But, the terrain was difficult and it presented a significant challenge to introduce heavy-duty equipment in such a delicate ecosystem. To realize the project, RFAT raised \$2 million in equity financing. A portion of this, \$810 thousand, was raised as follows: \$80 thousand through a seed round of investors; \$230 thousand through an initial public offering from the Bolsa National de Valores in Costa Rica; and \$500 thousand in venture capital financing through Boston Capital Ventures, L.P. In addition, RFAT obtained \$650 thousand in debt financing from Scotia Bank for a five-year final construction and working loan, priced at LIBOR+2% plus commission fees and OPIC insurance. Scotia Bank was interested in entering the Costa Rica market, while all other commercial banks expressed little interest. Thus, RFAT was able to raise about \$2.7 million dollars in total financing for the project, with a debt/equity ratio of 26% short term debt and 74% in equity. The project is successfully operating today and this is due in part to its dollar-based pricing for tourists. Shares of RFAT are thinly traded on the Costa Rican “Bolsa” as DOSEL (in English “canopy”) at approximately \$900 per share.

access to repayment than equity holders (investors and stakeholders). There are a variety of financial instruments which fall in between these two categories (i.e. mezzanine/junior debt, convertible debentures, etc..) which are employed in a great number of cases to fill in the financing gaps. Debt financing is considered less risky, because of the legal and contractual guarantees, and therefore carries a lower cost, i.e. an interest rate that is lower than the expected rate of return on equity. The holders of these financial instruments then avail themselves of the capital markets to trade these instruments (“securities”), because the underlying value of the instrument changes over time and this allows for the inherent risks and benefits to be shared among a wide variety of financial intermediaries (broker/dealers), investors and debt holders. The corporate issuer of the financial instrument is ultimately responsible for the performance of the instrument, and therefore liable for any losses incurred by investors and lenders.

in emissions trading. The first type of swap is between emissions rights. For example, swapping SO<sub>2</sub> for CO<sub>2</sub>. The other kind of swap may be swapping between different “types” or “vintages”. A different vintage may involve swapping for different delivery dates. For example, swamping a 2002 CER for a 2001 CER.

#### **Corporate Finance**

Typically, private sector projects are financed through corporate financial transactions (“on balance sheet”), issuing stock to the private or public capital markets or borrowing from lenders, where the fundamental guarantees to the investors and the lenders are the corporate assets. In the case of debt financing, lenders (i.e. commercial and investment banks) always enjoy, by law, senior or preferred

Usually, it is the equity holders in the company that sponsor the carbon offset project that own the rights to the Certified Emissions Reductions (CERs) or carbon credits that are generated. Typically, project sponsors may use these CERs to retire obligations that they have under domestic environmental regulations, or sell them in the market.

#### **Project Finance**

In the 1980s, project finance (“off balance sheet”) as opposed to corporate finance became increasingly popular as it shielded the corporation from liabilities (“limited or non-recourse financing”) and provided mostly lower cost long term debt financing, which allowed the private sector to become increasingly involved in managing and operating long term

public infrastructure assets. Environmental projects are considered infrastructure projects and will increasingly turn to project structured financing mechanisms in the future.

Under the project-financing scheme, a project is funded against the cash flow that is generated by the project. Risks are balanced against the project's cash flow and assets. The project is isolated from the parent firm as much as possible, sometimes established under a separate operating company to provide minimum exposure. Investments are made directly to the operating company, or by other mechanisms when a number of intermediate firms are involved in the contractual arrangement. Borrowing for the project does not show up as debt on the parent company's balance sheet. This arrangement removes or limits the parent company's assets from recourse action, so most if not all of the project risk is transferred to the lender. Thus, the structure of the project finance arrangement must provide the lender with sufficient security in another form. The additional costs associated with establishing a separate entity and managing the legal arrangements lead to projects being viable only when they are somewhat large.

## The Financial "Lock Box" Model: Contracts, Guarantees and Other Key Elements

The underlying soundness of the structured project finance model is that it allows the project to prosper on its own merits, without having to be supported externally, through subsidies or other schemes. Thus, the project is *by definition* viable or sustainable in the long run. Private sector environmental projects worldwide must seek this goal or the financial markets will not allow projects with global environmental benefits to prosper.

In fact, structured project finance rewards the party that was exposed to the most risk: which are the private sponsors or developers. However, this is the party that has the most experience and, therefore, is best suited to bear this risk, through their experience in developing, building and operating projects. Developers will not only contribute time and in-kind resources but also in most cases they provide a portion of the total financing requirements via equity contributions. (Typical infrastructure project debt to equity ratios are 80%:20% in OECD markets with lower debt leverages in economies in transition and developing countries.) Formal long-term contracts establish a legal framework for more passive investors and lenders to get involved with the financing of the project.

### Box 2: Example of Project Finance

In 1993, the IFC made its first renewable energy investment in a 10 MW hydroelectric project - Rio Bobos - sponsored by an industrial concern in Guatemala, Fabrigaz S.A, with a total project cost of US\$ 17 million. The debt/equity breakdown was approximately 60%/40% with approximately US\$10 million in long term 10 year loans coming from the IFC and co-financed with the Central American Bank for Economic Integration (CABEI) split evenly at US\$5 million each. The IFC also invested US\$1 million in equity out of the total US\$ 7 million in equity capital, giving it a 14% share in the project. The project was able to secure long term financing even though it was a run-of-the-river design due to an innovative tariff pricing scheme, which provided firm revenues to cover the debt service. The firm revenues were demonstrated by 40 year statistical rainfall statistics that proved that the water flow would be sufficient to generate firm power during the dry season.

Services provided by the project are usually subject to a pricing formula wherein a fixed revenue stream is generated by the project under take-or-pay clauses. This fixed revenue stream for a long period (10-30 years) becomes the basis for long-term financing and allows the lenders to provide credit with a reasonable assurance of repayment. Contracts normally require guarantees to ensure repayment, and guarantees can be in the form of collateral or other asset

securitization, local government guarantees based on its full faith and credit, and/or insurance. The debt financing therefore covers the fixed revenues stream, whereas the equity financing covers the variable revenue stream based on performance of the project, which will either punish the equity investors for non-performance or reward them for exceptional performance.

Thus the variable revenue stream can be shared among several investors, and these then may even buy and sell their shares in the project through private or public capital markets. Institutional investors (i.e. investment funds) may invest in the project, thereby providing an exit strategy to the developers, who can in turn use that freed-up capital for additional projects and the market value of the shares will vary with the perceived value of the asset. Similarly, lenders to the project will syndicate the loans into the bank marketplace and share the benefits and risks of their debt revenue stream with other institutions. The effect of these mechanisms allows different parties with different risk profiles to benefit from the project.

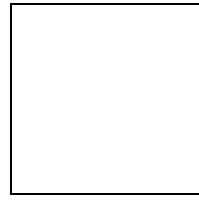
This construct is sometimes referred to as the financial “lock box” because it effectively locks in the inputs (revenue stream) and the outputs (payment stream). It was successfully employed in the commercial real estate development industry and is now increasingly successful in the global infrastructure arena. In the future, it is likely that new financial instruments for environmental projects will be created by pooling projects and investments. This is occurring now through global investment funds (such as the Renewable Energy and Energy-Efficiency Fund and other private sector investors) and will likely turn towards new instruments akin to Real Estate Investment Trusts (REITs), where the risk of one project is pooled with others and

outside institutional investors are presented with a well diversified portfolio.

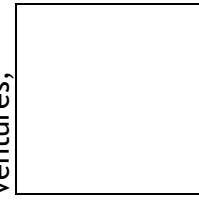
It is possible to structure a project financing scheme, wherein the debt holders secure the rights and privileges to the carbon revenues stream. An innovative mechanism is for the mezzanine or subordinated debt providers to receive an additional return through the sale of carbon credits, as long as they are willing to incur the higher risks and lower interest rates in order to satisfy addtionality requirements.

### Venture Capital

Venture capital has become a critical source of financing in the past two decades for private, small, rapidly growing firms, which do not have sufficient cash resources to maintain operations in the early stages of product development. Venture capital generally has four main objectives:



Providing capital for high-risk financial ventures;



Providing seed capital for start-up companies;

convertibility privilege for stock or through bonds with a warrant attached.

Investing in a firm that cannot raise capital from conventional sources; and,

Investing in large, publicly traded corporations where risk is significant.

Venture capitalists (partnerships, investment institutions, and wealthy individuals) generally are focused not on high income streams, but on growth and later, on the ability of the company to go public or a sale of the company to a third party (known as “exit strategies”), when the initial investment can be capitalized on. A venture capitalist generally will be involved through an equity share or by direct debt financing. With an equity participation arrangement, the venture capitalist is locked in for a time, without the ability to sell the stock quickly in response to market situations. He or she will accommodate this risk usually by taking a large role in management in the firm. If involved through a straight debt arrangement, the venture capitalist is likely to demand covenants to protect themselves in order to hedge the risk of firm or product failure. These covenants are similar to protective restrictions of a bank loan. Default on these long-term covenants generally results in the loss of control of a firm. The venture capitalist is also likely to require a sizable interest rate, but meeting these interest requirements is particularly difficult for a small start-up firm. The interest cost sometimes can be reduced by adding a

#### **Box 3: Example of Venture Capital**

Highland Energy Group, an energy services company - known as an ESCO - was founded in 1990 by US\$1 million from venture capitalists. Another US\$2 million were raised and the company expanded from only five to twenty-five employees. During the five year period when Highland was founded to when it reached its initial buyout stage, it developed over US\$50 million in performance contracting projects. Highland Energy was acquired in May of 1995 by EUA Cogenex. The sale of Highland Energy Group totaled US\$8 million and the venture capital returns to the shareholders were over 30 percent.

Venture capital is perhaps the most exciting area of traditional private sector finance, which can be brought to the carbon arena. Typically, in developing countries access to venture capital has been limited to those business groups, which have relationships to high net worth individuals in their countries, which are normally family ties. In short, venture capital sources in developing countries are limiting their investments to those business entrepreneurs with family or other close ties to the source, simply because the perceived risks are too high. These domestic sources of venture capital are few and are not generally open to financing environmental ventures. Venture capital would typically receive a pro-rata share of the carbon rights as part of their equity investment; however, it may be possible to structure an additional return for venture capitalists in lieu of other covenants they may normally provide.

#### **Letters of Credit**

The Letter of Credit (L/C) is a financial tool that is essential for reducing the risk involved with international transactions, usually between an importer and exporter. If an exporter

does not know an importer well, or if potential exchange restrictions apply in the importers country, then the exporter who sells on credit may demand that the importer's debt be backed by a foreign or domestic bank. Likewise, an importer may not want to pay an exporter until the goods are delivered. A L/C is used to satisfy both conditions.

A L/C is addressed to the exporter, and is written and signed by a bank acting on behalf of its customer, the importer. The letter establishes the criteria that must be met for the exporter to draw down a draft on the bank. Through a L/C, the bank agree to pay for the commitments of the importing firm. So, the L/C is a financial contract between the issuing bank and the designated beneficiary, in this case the exporter. This financial tool reduces the risk that payment will not be made or that the goods promised will be not delivered within given constraints. Thus, with a L/C, the importer is often able to reduce the overall cost of the transaction. It can be possible to structure L/C's for carbon transactions, but it is unlikely to develop as a financial structure until the carbon commodity has the low risk perception awarded to typical commodities.

## Insurance and Guarantees

Insurance and guarantees are frequently used for international trade and investment transactions to reduce the risks related to: expropriation -- the loss of an investment due to expropriation, nationalization, or confiscation by a foreign government; currency inconvertibility -- the inability to convert profits, debt service, and other remittances from local currency into U.S. dollars; and, political violence -- losses of assets due to war, revolution, insurrection, and civil strife. The insurance and guarantees reduce risk for the investor and help attract additional investors due to lower level of project risk. For large or high risk programs,

obtaining insurance coverage is nearly always a prerequisite for the program to go forward.

These insurance and guarantee programs are available from a wide range of sources, which are almost always public entities, such as the U.S. Overseas Private Investment Corporation, the U.S. Export-Import Bank, and the World Bank's Multilateral Investment Guarantee Agency. The insurance coverage limitations and requirements vary across countries and industries. Fees are generally based on a small percentage of the total project cost. These fees are not insignificant and far easier accommodated by large programs. In terms of carbon, one can think of providing insurance or a guarantee in exchange for carbon payments, as well as other guarantee payments.

## Factoring

Factoring is the process where a firm, or factor, purchases the accounts receivable of another firm. The factor may be a commercial finance company that specializing in factoring, or simply a commercial bank. A small firm can benefit from using a factor, since it presents insurance against bad debts that result from the inability to collect. The factor bears the risk of not being able to collect the receivables, but the firm is assured of a specified amount of cash for a given amount of receivables. This reduces the potential earnings of the firm, but the firm reduces operating costs since it does not have to staff and maintain a credit and collection department.

The fee paid to the factor for servicing the account is usually based on the face amount of all receivables, and will tend to parallel the risk that customers will not pay and the term of the receivables in question. For OECD countries, factoring fees generally are low, at 1% to 3 %, of a given amount of

<p>receivables. For many developing countries, collecting receivables is more risky, so factoring costs are higher.</p>	<p>The factor and the firm agree to the specified details on the factor's accounts, such as credit limits and other constraints that apply to the firm's customers. For non-recourse factoring, the factor may impose strict limits on the firm's deliveries to certain customers. This requirement to obtain the factor's approval to sell to certain customers may lead to a loss of sales, but since the factor is assumed to estimate better the risk of non-payment, the firm is prevented from making a larger loss. Factoring is generally not considered viable for carbon transactions.</p>	<p><b>Leasing</b></p> <p>A lease is essentially a medium- to long-term source of credit for a firm. The firm obtains the use of an asset, and makes a continuous stream of payments back to the asset owner over the term of the lease. Leases can reduce the overall cost of capital, since a lessee may be able to obtain an asset and maintain it at a lower cost than the lessor could if it purchased an asset outright. Lease accounting has important effects on financial statements.</p>	<p>There are three types of leases, (i) direct, (ii) sale and leaseback, and (iii) leveraged. Direct leases are available through a number of financial institutions. Under a sale and leaseback agreement, a firm sells land, buildings, or equipment that it owns to a lessor and simultaneously enters into an agreement to lease it back. The selling firm receives cash and agrees to make periodic rental payments. With a leveraged lease, a firm acquires the use of a good from a lessor through a combination of internal equity and third party assistance (commercial bank or insurance company). Furthermore, a particular lease agreement can be either a financial or operating lease. A financial lease, the most abundant form, is non-cancelable. An operating lease is cancelable at any time during the lease period. Financial leases normally extend over a long time frame with total monthly, quarterly, or annual payments approximating the purchase price of an asset plus financing charges.</p>	<p>Of all leases, only those which classify as capital leases must be included in the balance sheet (though operating leases are detailed in the footnotes to the financial statements). All others are considered operating leases for accounting purposes. A lease is a capital lease if it meets one of the following criteria:</p> <div style="border: 1px solid black; width: 100px; height: 50px; margin-top: 10px;"></div>	<p>The lease transfers ownership of a property to the lessee by the end of the lease term;</p>
---	--	---	--	---	--

	The lease contains a repurchase option;	In terms of carbon transactions, long-term leases are a viable solution to financing a project and the lessors may receive the rights to the carbon from the lessees in exchange for a lower lease payment or a longer maturity, for example.	
		<p>The lease term is equal to 75% or more of the estimated economic life of the leased property;</p> <p>The present value of the minimum lease payment equals or exceeds 90% of the excess of the fair value of the property over any related investment tax credit retained by the lessor.</p> <p>For a firm with a large number of non-capital leases, the balance sheet may not adequately reflect the true financial situation of the firm, especially debt amounts. Thus, some of the firms financial leverage indicators, such as the debt-to-equity ratio, will understate the firm's true leveraged condition.</p> <p>Leasing has been employed in some infrastructure projects recently, mostly by public sector agents which would not have access to off-balance sheet project finance. For example, Mexico's Federal Utility ("CFE") recently financed a 700 MW natural gas power plant in northern Mexico through a long term leasing arrangement with Citibank, N.A., the U.S. Exim</p>	<p>Financial intermediaries are an important tool for large and small firms for establishing and managing the financial arrangements for complex investments, especially for international infrastructure projects and carbon projects. In many cases, the investors who bring the equipment or the technology to a particular project will not be sufficiently skilled in identifying the entire range of financial sources available to fund the project, nor the full range of financial variables involved, including market structures and regulatory effects, that exist in the project's host country. For off-balance sheet operations, knowledge of potential financial resources becomes an even more important consideration. By their use of knowledge in financial markets and tools, and through their knowledge of host country market, financial, and accounting practices, financial intermediaries, such as banks, investment groups, and consultants, are well suited to establish a viable financial package for investors. This is especially true for small projects where the investing firm has limited internal resources to identify and assess the full range of domestic and international financial variables. The intermediaries generally are better skilled at identifying project financial risk, and through linkages in the financial markets, are able to better reduce risk and diversify or hedge residual risk, making the project more financially viable.</p>

Financial intermediaries can also play an important role by bundling several projects, financing requirements and then sourcing the equity capital and debt required in larger amounts, which drives both financing and transaction costs down. Carbon intermediaries or brokers can also play a very significant role in the carbon transactions, and it is usually these parties that have structured the carbon transactions to date.

## The Carbon Contract

Under a carbon contract, whether a performance contract or other type, a project sponsor enters into a long-term carbon offset delivery obligation with a buyer. Once the contract is in place, the lenders would be able to treat the carbon revenues as they would any other revenue stream. Ultimately, the impact of additional revenue from carbon offset sales on project financing could be an alternative way to achieve commercial viability, alternative to subsidies, special tariffs, grants, or other non-commercial mechanisms. From the perspective of investors, the additional revenue would lead to a more secure cash flow to cover debt servicing and/or improved credit terms (i.e. longer maturities, lower interest rates, etc.) for lenders.

This approach was introduced to the economics of a standard energy efficiency project implemented for two breweries in Mexico. Financing for the project was provided by a U.S.-based environmental fund (Environmental Assistance Fund, EEAF) and private investors (EIC). The financing was provided to a Mexican Energy Services Company (ESCO) that performed the engineering analysis and design of the EE measures at the breweries. Under a five-year, shared savings, performance-based contract, the brewery makes quarterly lease payments to the ESCO based on actual savings

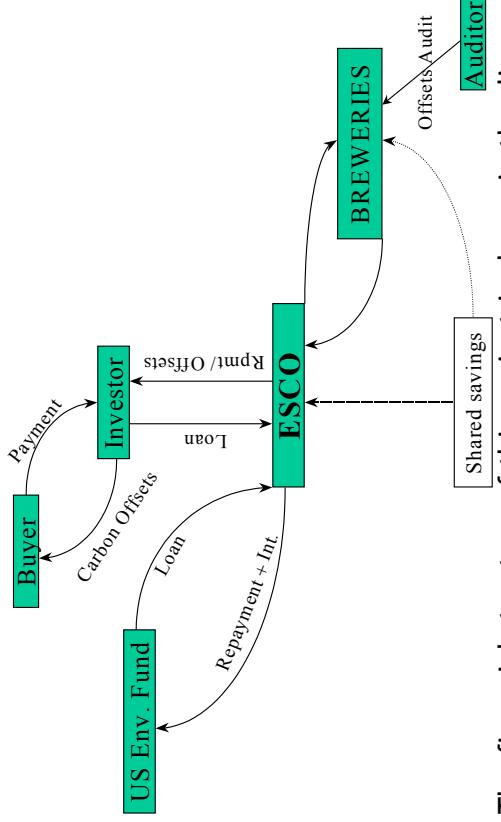
measured by the brewery. The ESCO, in turn, repays the U.S. and Mexican investors.

The reduced energy consumption resulting from the installed efficiency measures will lead to expected carbon offsets of more than 5,000 tons over the five year term of the contract. These offsets are available for sale or trade in anticipation of a formal trading market in the future. Under the terms of the contract, EIC will receive the rights to the carbon credits.

This transaction also will be executed under a performance-based contract, which will help minimize the risks that the offsets are not delivered on time or in the agreed amounts.

This project is one of the first energy efficiency performance contracts to be executed in Mexico. The project will be instrumental in helping to improve the overall conditions for capitalizing on the benefits of such projects in the Mexican energy and industrial sectors, and will help stimulate the emerging energy services sector there.

## MEXICO EE/CARBON PROJECT



The financial structure of this project is shown in the diagram below. In this model, the carbon credit buyer provides the investor with the capital to participate in the ESCO project. The buyer may directly invest in the project, but it is possible that intermediaries will take on the role of pooling carbon purchase funds and securing deliveries through carbon contracts on behalf of purchasers. For example, an intermediary may lend to a project at commercial rates that are below its internal cost of capital, intending to make up the difference plus a profit through the sale of the project's carbon credits that it receives in addition to repayment of the loan.

On a more conventional project finance basis, a commercial bank may in the future be able to lend to the project directly on the basis of the anticipated cash flows from the carbon sales. These need not represent all of the debt required for the project, but rather a portion of the debt that nevertheless makes the overall project commercially viable. Lenders are traditionally seeking coverage of debt service obligations at a ratio of 150% or more for what are perceived to be high-risk projects.

## Financing Barriers

Much analysis has been conducted on the issues and barriers of private sector environmental project development and financing, especially vis-à-vis carbon projects generating CERs. Less information is available on the issues germane to the operation of projects, due to the lack of sufficient numbers of projects in operation in developing countries. Some of the barriers are simply due to prohibitively high transaction costs; others have more to do with the lack of adequate commercial contractual agreements from the buyers (i.e. bankable long term contracts and payment guarantee mechanisms for uncredit worthy local public sector customers) and regulatory uncertainty (no transparent pricing formulas). Other barriers tend to address technical uncertainties of environmental projects, in as much as they may lack predictability of performance and hence guarantees thereof. All of these issues affect the project development cycle enormously.

Barriers for commercial long term financing of environmental projects are still significant. There are two general areas which represent barriers to environmental project financing for carbon projects:

Availability of long term debt financing.

projects cannot absorb these costs into the overall economics of the project, in terms of Net Present Value (NPV).

Another major barrier hindering environmental debt financing is the lack of long-term contractual agreements and the attendant lack of guarantees for the contracts, including those that relate to the sale of CERs and the financing thereof. Traditionally, infrastructure projects benefit from this treatment from the “customers” of the services (local government, municipal and federal agencies). Small environmental projects have struggled to receive this treatment for a variety of reasons, but primarily there tends to be a lack of a formal regulatory structure for environmental projects in most developing countries not only in the environmental regulations arena but also in many cases in the privatization of environmental services arena.

Even when long term contracts, containing take-or-pay clauses and incentive structures, are successfully negotiated with developing country public agencies, often these agencies are not considered investment grade risk and financing is not feasible without guarantees. There are two types of guarantees which are relevant to environmental projects: technical and commercial. Technical guarantees are important for a project’s performance, and it is assumed that if a new environmental technology is being proposed, sufficient testing and experimentation has been conducted to warrant the projected performance. The issue of commercial contractual guarantees poses an interesting economic development conundrum. While developing countries are encouraged to privatize and reform their economies towards market-based structures, guarantees from central governments are being required to secure long term debt from the private sector, which does not fundamentally shift the liability off the government’s balance sheet. Since the available exposure of any given government is limited,

Size and transaction costs.

Lack of long-term contracts for environmental projects.

Availability of local currency financing.

Among the barriers to availability of long term debt financing for private sector environmental projects, the issue of size and transaction costs will prevent most commercial banks from getting involved for this reason alone. Independent of size, environmental projects require a great deal of work in terms of the services of bankers, lawyers, engineers and developers in order to ensure that the project is structured in a sound fashion (i.e. the financial “lock box”). These costs for professional services are not a function of size, but rather time. In fact, these costs are relatively inelastic with respect to project size and, consequently, small

environmental projects requiring government guarantees have to compete with other priorities for that treatment. CERs can play an interesting risk mitigating role as guarantees from buyers in carbon projects can successfully leverage the other financing required.

The issues surrounding the lack of local currency debt financing for environmental projects are similar to those for foreign exchange debt. However, to add to the above mentioned issues, local currency credit is hampered by a high cost of debt (in terms of interest rates and maturity structures) as well as a lack of familiarity with project finance structures at local financial institutions. This is due primarily to the lack of experience in these types of transactions, and as the economic reforms continue to take hold, local bankers' experience will also grow.

There has been developed an agile incremental cost framework for the environmental projects, given the typical profile of a small and capital-needy project. This incremental cost definition is a *financial* incremental cost as opposed to an *economic* incremental cost, because private sector firms are concerned with these costs as they impact their projects. Hence, the term is defined as follows:

**Incremental or Additional Cost:** Those project costs, which commercial sources will not fund.

Given this definition, the remaining questions that need to be addressed refer to (a) what the definition is of “commercial sources” and (b) how to determine if these should fund a project and how much commercial financing the project should obtain.

The first question is easily accounted for in theory, and the previous section illustrates all the potential commercial sources of funding. The technical definition indicates that commercial sources of financing would be available if the project's expected IRR is greater than its risk-adjusted cost of capital.

The proposed approaches to the financing modalities for carbon transactions indicate that a great deal of analysis has been carried out to evaluate public sector *incremental* or *additional costs*, quantify these and address these costs in the context of environmental projects. It is important to point out the distinction made throughout the literature regarding global environmental benefits vis-a-vis development and local environmental benefits, for which other sources of funds are appropriate. It should be mentioned that while the priority is to fund environmental incremental costs, which otherwise are difficult to finance, this does not preclude the other financing activities that exceed the established incremental costs.

## Incremental Cost or AdditioNality Framework

The second question involves further definition of how to evaluate a project's risk-adjusted cost of capital ( $R_r$ ). A simple and effective definition of  $R_r$  is as follows:

$$R_r = R_f + R_t + R_c + R_p$$

Where:  $R_f$  = Risk Free rate in US\$  
 $R_t$  = Risk premium for term (if shorter than proposed financing)  
 $R_c$  = Currency premium (if financing is in local currency or revenues are)  
 $R_p$  = Risk premium for project

Calculating  $R_r$  can be difficult for projects in countries where financial instruments are not prevalent and there is a lack of familiarity with equity returns. In capital markets, this calculation is made simpler by the vast quantity of analytical data available. Therefore, calculating risk-adjusted equity returns is simpler. An example of this calculation is provided for a typical developing country electric firm's expected equity returns in US\$.

Using the Capital Asset Pricing Model (CAPM), see Ross and Roll, it is possible to develop an expected equity return for the foreign firm ( $u$ ) in country  $x$ , by making assumptions regarding U.S. equity returns and adapting to the foreign context. The CAPM formula (analysis in U.S.\$) is as follows:

$$R_u = R_{F,x} + \beta_u(R_w - R_F);$$

Where:

$R_u$  = Expected returns for foreign firm

$R_{F,x}$  = Risk free rate, country  $x$

$\beta_u$  = Beta coefficient for foreign firm

$R_w$  = Market returns (U.S.)

$R_F$  = Risk free rate (U.S.)

The key consideration then for *financial additionality* would be whether the project's expected returns (IRR) were greater than its WACC, i.e.  $IRR > WACC$ . If the sale of CERs provides an additional revenue stream that enhances the IRR without increasing the cost of capital, i.e. the WACC, then the project can successfully claim financial additionality. However, the transaction costs required for CER's institutional processing requirements do add costs to a project and the above relationship may be impaired.

$$R_{F,x} = R_F + P_x;$$

Where:

$R_F$ = U.S. Treasuries (long term bonds) =	7% (approx.)
$P_x$ = X country risk premium = $\Delta$ (foreign long term bonds - U.S. bonds)	

A beta coefficient will not be available in most projects, but in certain cases it is possible to apply an industry or US-based firm's beta coefficient, if the proposed project is similar enough to the a US or other OECD industry benchmark. It should be noted that this formula applies to the equity capital and not debt capital. A project will likely be financed with both debt and equity and therefore the risk-adjusted cost of capital will reflect a weighted average cost of capital (WACC), which will be weighted according to the debt and equity breakdown. The WACC can be calculated based on the above CAPM formula with a weighted component relative to the debt available (in US\$) to the project.

## Prices and volumes of CERs

The following table is a summary of international CER or greenhouse gas (GHG) trades reported to date. The market is in its initial stages. It is highly difficult to predict future prices as a result but there is a general range of approximately \$1-10/metric ton of CO2 offset. An analysis of the Kyoto Protocol commitments suggests a potential

demand in excess of 600 million metric tons of carbon equivalent (not CO<sub>2</sub>) per year. The monetary volumes could

be as high as \$10 billion dollars per year; however, this has not been reflected in actual trades, as we can see below.

**Table 1: International GHG Trades Reported**

Seller	Buyer	Location of Project	Type	Quantity	Project Cost	\$/mt CO <sub>2</sub>	Date
FONDO BIO-CLIMÁTICO	FEDERATION INTERNATIONALE DE L'AUTOMOBILE	Chiapas, Mexico	Forestry (conservation)	5,000 tons. CO <sub>2</sub>	\$50,000	\$10/mt CO <sub>2</sub>	Feb. 1997
Northeast Utilities	GEMCo	Groton, United States	Renewable (Landfill Gas CH <sub>4</sub> to power fuel cell)	n/a	n/a		Jul. 1997
Costa Rica	Norway	Costa Rica	Forestry (reforestation)	1,000 carbon, up to 200,000 mt carbon	mt	n/a	1997
Niagara Mohawk Power	Suncor Energy	NEW YORK, USA	RENEWABLE, ENERGY EFFICIENCY, FUEL SWITCHING	100,000 mtCO <sub>2</sub> equiv., up to 10 million mt	n/a	n/a	Mar. 1998
Southern California Edison (SCE)	Ontario Hydro	California, United States	n/a	10,000 t CO <sub>2</sub>	\$40,000	\$4/mt CO <sub>2</sub>	1997
Bolivian Gov.	USA (American Electric Power, BP America, Pacific Corp.)		Forestry (reforestation)	16 million mt CO <sub>2</sub> equivalent	\$9.5 million	\$9.5 million	Mar. 1998
Unified Energy System	Sumitomo	Russia	Fuel Switching (coal to natural gas)	Up to 10 million mtCO <sub>2</sub> equiv./yr	n/a		Mar. 1998
Zahren Alternative Power Corp. (ZAPCO)	Ontario Generation	UNITED STATES	Renewable (Landfill gas)	2.5 mt CO <sub>2</sub> equiv./yr.	n/a		Oct. 1999
Iowa Farmers organized by IGF Insurance Company	GEMCo Consortium Members (7)	Iowa, USA	Agriculture	2.8 mtCO <sub>2</sub> equivalent	n/a		Oct. 1999

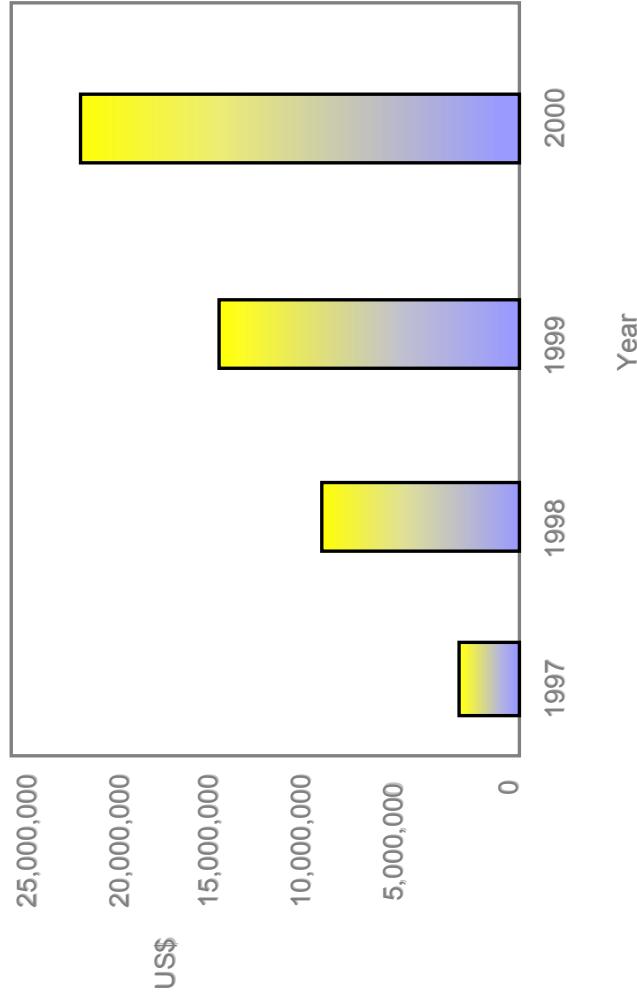
Seller	Buyer	Location of Project	Type	Quantity	Project Cost	\$ /mt CO2	Date
Transalta	Hamburgische Electricitäts- Werke AG (HEW)	Germany	Renewable Power	(Wind 24,000 CO2e	n/a		June 2000
Romania	Switzerland	Romania	Energy (District Heat Systems)	140,000 CO <sub>2</sub> , tons	\$640,000	\$4.57/mt CO2	1998
ICE (Costa Rica)	Holland Groep)	Costa Rica	Renewable Power	(Wind N/a	\$4.5 MM		Feb. 2000
State Forest of New South Wales, Australia	Tokyo Electric Power	Australia	Forestry (reforestation)	N/a hectares of forest)	\$18.9 MM		Feb 2000
Erenmax	Environment Canada and Natural Resources Canada (representing the Gov. of Canada)	Alberta, Canada	Renewable Power	(Wind 427 mtCO <sub>2</sub> from 1997, up to 2,777 mt/yr. until 2008	n/a	Feb. 2000	
Star Lake Hydro Partnership Canada and Abitibi Consolidated	Ontario Power Generation	Newfoundland, Canada	Renewable power	(hydro 89,912 mtCO <sub>2</sub> in 1999	n/a	1999	

SOURCE: EIC



The total volume to date is under \$100 million dollars of committed transactions, however the trend is definitely towards an increasing volume of CERs transactions. In the table below we indicate a growing trend, and it is expected that within two to three years annual CERs transactions will be in excess of US\$100 million per year.

### Upward Trend in Transactions Estimated Value of Trade



SOURCE: EIC

### References

- Ashford, Michael S.; "Risk Allocation and Mitigation for Private-Sector Financing of Hydroelectric Projects in Nepal/Technical Assistance for the Electricity Development Center - HMB/Nepal," prepared for USAID and Acres International Corporation, August 1996
- Brealey, Richard and Myers, Stewart, Principals of Corporate Finance, 1984, McGraw-Hill.
- Econergy International Corp. (EIC) and Pacific Northwest Lab (PNL), 1997. Financing Mechanisms for Renewable Energy and Energy Efficiency in Emerging Markets, Battelle Pacific Northwest National Laboratory, Washington, November.
- International Finance Corporation (IFC), Rubino, M., Younger, D., and Moscarella, J.P., Private Capital for the Global Environment, August 1998.
- Levich, Richard M., International Financial Markets, 1998, McGraw-Hill.
- Renewable Energy in the Americas (REIA), Ashford, Michael and Moscarella, J.P., Financing Hurdles for Renewable Energy Project Development in Latin America, October 1995, revised for REIA II, July 1997.
- Swisher, J.N., 1997a. Using Area-Specific Cost Analysis to Identify Low Incremental-Cost Renewable Energy Options: A Case Study of Co-Generation Using Bagasse in the State Of São Paulo, prepared by E4 Inc. for the Global Environment Facility, Washington, DC.

# Appendix I - Glossary

## A

### **Accreditation Body**

The accreditation body shall accredit independent entities, in accordance with the standards and procedures contained in Appendix A of the Kyoto Protocol and relevant decisions by the Executive Board and the COP/MOP.<sup>150</sup>

### **Activities Implemented Jointly (AIJ)**

Under a pilot phase that was suppose to end in 2000, was extended at COP-6, AIJ activities can be carried out through partnerships between an investor from a developed country and a counterpart in a host country. The purpose is to involve private-sector money in the transfer of technology and know-how.<sup>151</sup>

### **Adaptation**

The degree to which adjustments are possible in practices, processes, structures or systems in response to projected or actual changes in climate. Adaptation activities contribute to the mitigation of the effects of climate change on terrestrial and aquatic ecosystems, hydrology and water resources management, agriculture and forestry, human infrastructure, and human health.<sup>152</sup> Examples of adaptation activities include introducing different crops to compensate for local climate change and protection of coastal areas from sea-level rise. Adaptation can be spontaneous or planned, and can be carried out after the fact or in anticipation of changes in climatic conditions. Areas that are particularly vulnerable to the effects of climate

change -- low lying islands, for example -- will need to consider adaptation options as a response to possible future changes. The **Clean Development Mechanism** (CDM) under the **Kyoto Protocol** has a provision for assisting "developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation"<sup>153</sup>, although the terms of this provision have yet to be decided upon.

### **Additionality**

The Kyoto Protocol establishes the requirement that joint implementation and Clean Development Mechanism (CDM) projects may only count emissions reductions that are "additional to what otherwise would have occurred in the absence of the certified project activity"<sup>154</sup> (*environmental additionality*). These reductions must be "real" and "measurable" and must be quantified against a project baseline against which the additionality of the project can be measured and tested. Central to the discussion of additionality is that of what constitutes a project baseline.

A COP-1 decision on Activities Implemented Jointly under the pilot phase expresses another form of additionality (*financial additionality*). It states that "the financing of activities implemented jointly shall be additional to the financial obligations of Parties included in Annex II of the Convention within the framework of the financial mechanism as well as to current official development assistance (ODA)".<sup>155</sup> Another interpretation of *financial additionality* is the notion that a project is made commercially viable through its ability to generate value in the form of certified emissions reductions. Here again, no internationally agreed upon method for determining additionality is available.

<sup>150</sup> FCCC/SB/2000/4

<sup>151</sup> UNFCCC: <http://www.unfccc.org.siteinfo/glossary.html>

<sup>152</sup> Ingo Puhl, Joint Implementation Definitions and Terminology, Center for Clean Air Policy

<sup>153</sup> UNFCCC-The Kyoto Protocol. Article 12.8.

<sup>154</sup> UNFCCC-The Kyoto Protocol. Article 12.5c.

<sup>155</sup> FCCC/CP/1995/7/Add.1Decision5/CP.1, Activities Implemented Jointly under the Pilot Phase

**Ad hoc Group on Article 13 (AG13)**  
A subsidiary body (committee) created by COP-1 to explore how to help governments overcome difficulties they may experience in meeting their commitments to the Kyoto Protocol.

#### **Ad hoc Group on the Berlin Mandate (AGBM)**

A subsidiary body created by COP-1 to conduct the talks that led to the **Kyoto Protocol**; the AGBM concluded its final meeting on 30 November 1997.<sup>156</sup>

#### **Afforestation**

Planting of new forests on lands, which, historically, have not contained forests. These newly created forests are included in the category 'Changes in Forest and Other Woody Biomass Stocks in the Land Use Change and Forestry Module' (IPCC) of the emissions inventory calculations.<sup>8</sup>

#### **Annex I Parties**

Annex I to the Climate Convention (UNFCCC) lists all the countries in the Organization of Economic Cooperation and Development (OECD), plus **countries with economies in transition**, Central and Eastern Europe (excluding the former Yugoslavia and Albania). By default the other countries are referred to as Non-Annex I countries. Under Article 4.2 (a&b) of the Convention, Annex I countries commit themselves specifically to the aim of returning individually or jointly to their 1990 levels by the year 2000.<sup>157</sup> Ratification of the Kyoto Protocol would mean their acceptance of emission targets for the period 2008 - 2012 as per Article 3 and Annex B.<sup>158</sup>

#### **Annex II Parties**

The countries listed in this Annex II to the UN Framework Convention on Climate Change. These countries have a special obligation to help developing countries with financial and

technological resources. They include the 24 original OECD members plus the European Union.<sup>159</sup>

#### **Annex A**

Annex A of the **Kyoto Protocol** lists the **Greenhouse Gases (GHGs)** regulated by the Protocol as well as sector/source categories. The gases are: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>). The base year for calculating emission reduction commitments is 1990 for the first three gases and 1995 for the other three.

#### **Annex B**

Since the **Kyoto Protocol** is a separate legal instrument and must be ratified separately, a new list of countries taking on legally binding commitments along with a listing of their actual commitments was created. Annex B consists of all of those countries listed in Annex I of the FCCC with the exception of Turkey and Czechoslovakia. New countries added to Annex B include: Croatia, the Czech Republic, Liechtenstein, Monaco, Slovakia and Slovenia.<sup>160</sup> Annex B lists the **Quantified Emission Limitation and Reduction Commitment (QELRC)** for each country.

#### **Anthropogenic**

Derived from human activities.<sup>161</sup>

#### **Article 4.1 (UNFCCC)**

This Convention article contains general commitments for all Parties - developing and developed<sup>162</sup>, taking into account their common but differentiated responsibilities and their specific national and regional priorities, objectives and circumstances.<sup>163</sup>

#### **Article 4.2 (UNFCCC)**

<sup>159</sup> UNFCCC: <http://www.unfccc.org/siteinfo/glossary.html>

<sup>160</sup> UNFCCC. Kyoto Protocol. Annex B.

<sup>161</sup> IPCC. Methodological and technological issues in technology transfer. 2000.

<sup>162</sup> UNFCCC: <http://www.unfccc.org.siteinfo/glossary.html>

<sup>163</sup> UNFCCC: <http://www.unfccc.org.siteinfo/glossary.html>

This Convention article contains specific commitments for developed country (**Annex I**) Parties only, notably to take measures aimed at returning greenhouse gas emissions to 1990 levels by the year 2000.<sup>164</sup>

### **Assigned amounts**

According to Article 3.7 in the Kyoto Protocol, " from 2008-2012, the assigned amount for each party included in Annex I shall be equal to the percentage inscribed for it in Annex B of its aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouses gases listed in Annex A in 1990, or the base year or period determined in paragraph 3.5, multiplied by five."<sup>165</sup> According to Articles 3.10, 3.11 and 3.12, "parts of" assigned amounts may be transferred from one Party to another via international joint implementation under Article 6 and emissions trading between Annex I countries under Article 17, and certified emissions reductions acquired via the Clean Development Mechanism (CDM) under Article 12 may be added to that Party's assigned amount.<sup>166</sup>

**Avoidance**  
The avoidance of **Greenhouse Gas** emissions resulting from the substitution of a high emitting source with a lower or non-emitting source or through improvements in energy efficiency.<sup>168</sup>

### **B**

**Banking**  
Banking of emissions, which refers to the saving of emissions credits for future consumption or trading, can take three forms: 1) holding reductions within a commitment period, 2) applying reductions earned from one period to another, or, 3) applying reductions earned before the first compliance period via the Clean Development Mechanism.

Articles 3. 13 and 12.10 of the Kyoto Protocol refer to banking. Article 3.13 states that "if the emissions of a Party included in Annex I in a commitment period are less than its assigned amounts, the difference shall, upon the request of that Party, be added to the assigned amount for that Party for the subsequent commitment period".<sup>169</sup> This, in effect, allows a Party which over-complies with its emission reduction commitments the choice whether to trade its excess reductions or "bank" them as a hedge against future difficulties in meeting them.

Article 12.10 states that certified emissions reductions (CERs) (under the Clean Development Mechanism) obtained during the period from 2000 up to the beginning of the first commitment period (2008) can be used to assist in achieving compliance in the first commitment period.<sup>170</sup>

### **Base year**

According to the IPCC, the Base Year is that year for which a national inventory is to be taken, which is currently 1990 for Annex I countries. In some cases (such as estimating Methane from rice

<sup>164</sup> UNFCCC: <http://www.unfccc.org/siteinfo/glossary.html>

<sup>165</sup> UNFCCC. The Kyoto Protocol, Article 3.7.

<sup>166</sup> UNFCCC: The Kyoto Protocol, Articles 3.10, 3.11 and 3.12.

<sup>167</sup> EPA: <http://www.epa.gov/globalwarming/glossary.html>

<sup>168</sup> Figueres, C., . et al. "Implementing JI/AU: A guide for establishing joint implementation programs". CSDA. 1996

<sup>169</sup> UNFCCC. The Kyoto Protocol, Article 3.13.

<sup>170</sup> UNFCCC. The Kyoto Protocol, Article 12.10.

production), the base year is simply the middle of a three-year period over which an average must be taken.<sup>171</sup> A base year may also be used as a reference for establishing an emissions baseline. Under the Kyoto Protocol, the base year for hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride is 1995.<sup>172</sup>

**Baseline**

Standard by which to measure verifiable changes in carbon stocks for the purpose of determining net changes of Greenhouse Gas emissions from anthropogenic activities.

**Berlin Mandate**

The Berlin Mandate launched the talks that led to the adoption of the Kyoto Protocol in 1997.<sup>173</sup>

**Biomass**

The total dry organic matter or stored energy content of living organisms. Biomass can be used for fuel directly by burning it (e.g. wood), indirectly by fermentation to an alcohol (e.g. sugar), or by extraction of combustible oils (e.g. soybeans).<sup>174</sup>

**Borrowing**

Within the context of a Greenhouse Gas emission trading regime, borrowing refers to using future emissions reductions from future commitment periods in order to meet current emissions targets.<sup>175</sup>

**Bubble**

The generic concept of a "bubble" refers to the idea that emissions reductions anywhere within a specific area count towards a

common reduction goal -- as if a giant bubble were placed over the various sources to contain them in a common area.

**Bureau**

Responsible for directing the work of the COP. Its 10 members are delegates elected by each of the five regional groups and they include the COP President, six Vice Presidents, the Chairs of SBI and SBSTA, and a rapporteur. In addition, each subsidiary body also has its own Bureau.<sup>176</sup>

## C

**Capacity Building**  
Increasing skilled personnel and technical and institutional capacity.<sup>177</sup>

**Carbon**

Chemical Element. Animals and plants are carbon-based.

**Carbon-based resources**

The recoverable fossil fuel reserves (coal, crude oil, oil shale, tar sands, natural gas) that can be used for energy production/consumption.<sup>178</sup>

**Carbon Cycle**

The natural processes that influence the exchange of carbon (in the form of carbon dioxide, carbonates and organic compounds, etc.) among the atmosphere, ocean and terrestrial systems. Major components include photosynthesis, respiration and decay between atmospheric and terrestrial systems (approximately 100 gigatons/year); thermodynamic invasion and evasion between the ocean and atmosphere, operation of the carbon pump and mixing in the deep ocean (approximately 90 gigatons/year). Deforestation

<sup>171</sup> IPCC Glossary: <http://www.ipcc.ch/pub/gloss.pdf>

<sup>172</sup> Kyoto Protocol:

<http://www.unfccc.int/resource/docs/convkp/kpeng.pdf>

<sup>173</sup> UNFCCC: <http://www.unfccc.org/siteinfo/glossary.html>

<sup>174</sup> IPCC: Special report on methodological and technological issues in technology transfer. 2000

<sup>175</sup> U.S. Country Studies/Initiative for Joint Implementation Glossary of Commonly Used Terms, 1997

and fossil fuel burning releases approximately 7Gt into the atmosphere annually. The total carbon in the reservoirs is approximately 2000 Gt in land biota, soil and detritus, 750 Gt in the atmosphere and 38 000 Gt in the oceans.<sup>179</sup>

### **Carbon Dioxide (CO<sub>2</sub>)**

A naturally occurring gas. It is also a by-product of burning fossil fuels and biomass, as well as land-use changes and other industrial processes. It is the principal anthropogenic GHG that affects the Earth's temperature. It is the reference gas against which other GHGs are measured and therefore has a **Global Warming Potential** (GWP) of 1.<sup>180</sup>

### **Carbon Sequestration**

The long-term storage of carbon CO<sub>2</sub> in the forests, soils, ocean or underground in depleted oil and gas reservoirs, coal seams and saline aquifers. Examples include the separation and disposal of CO<sub>2</sub> fuel gases or processing fossil fuels to produce H<sub>2</sub>- and CO<sub>2</sub>-rich fractions, and the direct removal of CO<sub>2</sub> from the atmosphere through land use change, afforestation, reforestation, ocean fertilization and agricultural practices to enhance soil carbon.<sup>181</sup>

### **Carbon Sinks**

Natural or anthropogenic systems that absorb CO<sub>2</sub> from the atmosphere and store them. Trees, plants and the oceans all absorb CO<sub>2</sub> and, therefore, are carbon sinks.<sup>182</sup>

### **Carbon Source**

A pool (reservoir) that gives up carbon to another reservoir within the **Carbon Cycle**. For example, if the net exchange between the **Biosphere** and the **Atmosphere** is toward the ocean, then the Biosphere

atmosphere is the source.<sup>183</sup> Common human sources include: fossil fuel combustion, solid waste decomposition, land use change, and transport.<sup>179</sup>

### **Carbon Stocks**

Carbon stocks include carbon stored in vegetation (above and below ground), decomposing matter, soils, wood products, and the carbon substituted by burning wood for energy instead of fossil fuels.<sup>184</sup>

### **Certification**

The process by which an independent accredited body (operational entity) gives written assurance of the emission reductions that have been achieved. In the case of an activity under the **Clean Development Mechanism** under the **Kyoto Protocol**, certification also gives assurances that the reductions occurred under the conditions (sustainable development objectives have been met) necessary for recognition by the Parties.<sup>185</sup>

### **Certified Emission Reductions (CERs)**

A unit of **Greenhouse Gas** reductions that has been generated and certified under the provisions of Article 12 of the Kyoto Protocol, the **Clean Development Mechanism (CDM)**. In contrast, **Emissions Reduction Units (ERUs)** are used for **Joint Implementation (JI)** under Article 6 of the Protocol. According to Article 12, CERs must be "certified by operational entities to be designated by the Conference of the Parties (COP) serving as the Meeting of the Parties (MOP)".<sup>186</sup>

<sup>183</sup> U.S. Country Studies/Initiative for Joint Implementation Glossary of Commonly Used Terms, 1997

<sup>184</sup> Parks et al. "An Economic Approach to Planting Trees for Carbon Storage" in *Economics of Carbon Sequestration in Forestry*. R.A. Sedjo, R.N. Sampson, and J. Wisniewski (eds.), CRC Press LLC, New York, 1997

<sup>185</sup> Kyoto Protocol:

<http://www.unfccc.int/resource/docs/convkp/kpeng.pdf>

<sup>186</sup> Kyoto Protocol:

<http://www.unfccc.int/resource/docs/convkp/kpeng.pdf>

### **Certified Tradable Offset (CTO)**

A financial instrument that can be used to transfer (sell) Greenhouse Gas offsets in the international marketplace. A Certified Tradable Offset (CTO) represents a specific number of units of greenhouse gas emission expressed in carbon equivalent units reduced or sequestered. The home-country verification process certifies that the offsets are of high enough quality to allow them to count against national and company-level greenhouse gas reduction commitments, if such crediting is eventually permitted under the UNFCCC.<sup>187</sup>

### **Chlorofluorcarbons (CFCs) and Related Compounds**

This family of anthropogenic compounds includes chlorofluorcarbons (CFCs), bromofluorcarbons (halons), methyl chloroform, carbon tetrachloride, methyl bromide, and hydrochlorofluorcarbons (HCFCs). These compounds have been shown to deplete stratospheric ozone, and therefore are typically referred to as ozone depleting substances. The most ozone depleting of these compounds are being phased out under the Montreal Protocol.<sup>188</sup>

### **Clean Development Mechanism (CDM)**

The text of Article 12 currently describes more of an idea than an operational entity. Highly innovative, it has the potential to meet the needs of both developing and industrialized countries. It could help solve non-Annex I needs for capital for the financing of technology transfer for clean, energy efficient economic development and for addressing environmental issues such as loss of biodiversity, while also providing a lower cost, more flexible alternative for Annex I countries to meet emissions reduction targets.

According to Article 12 of the Kyoto Protocol, the "purpose of the Clean Development Mechanism shall be to assist Parties not included in Annex I in achieving sustainable development, and to contributing to the ultimate objective of the Convention, and to

assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3."<sup>189</sup>

### **Climate Change**

A change in climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability over comparable time periods.<sup>190</sup>

### **Climate Model**

Large and complex computer programs used to mathematically simulate global climate. They are based on mathematical equations derived from our knowledge of the physics that governs the Earth-atmosphere system.<sup>191</sup>

### **Co-generation**

The use of waste heat from electric generation, such as exhaust from gas turbines, for either industrial purposes or district heating.<sup>192</sup>

### **Commitment Period**

The commitment period, sometimes referred to as the "compliance period" or the "budget period", is the time frame given to Parties to the Kyoto Protocol to meet their quantified emission limitation and reduction commitments (QELRCs) established in Annex B. Under the Kyoto Protocol the first commitment period is 2008-2012, during which the assigned amount (of emissions) for each Party (on average, 5% below 1990 emission levels) included in Annex I must be equal to or lower than the percentage listed for it in Annex B multiplied by five.<sup>193</sup>

### **Conference of the Parties (COP)**

<sup>189</sup> UNFCCC. The Kyoto Protocol. Article 12.2.

<sup>190</sup> UNFCCC definition.

<sup>191</sup> IPCC. Special report on emissions scenarios. 2000  
<sup>192</sup> IPCC. Special report on emissions scenarios. 2000

<sup>193</sup> UNFCCC. The Kyoto Protocol. Article 3.7.

The COP is the supreme body of the Convention. It currently meets once a year to review the Convention's progress. The world "conference" is not used here in the sense of "meeting" but rather of "association" the Parties.<sup>194</sup>

## COP Sessions

The first session of the Conference of the Parties (COP-1) was held in Berlin from 28 March to 7 April 1995, the second (COP-2) in Geneva from 8-19 July 1996, the third (COP-3) in Kyoto from 1-11 December 1997, the fourth (COP-4) in Buenos Aires from 2-13 November 1998, the fifth (COP-5) in Bonn from 25 October to 5 November 1999, and the sixth (COP-6) in The Hague from 13-24 November, 2000.<sup>195</sup>

## Countries with Economies in Transition (EIT)

Those Central and East European countries and former republics of the Soviet Union that are in transition to a market economy.<sup>196</sup>

## Credit

Originally defined as a "quantifiable and verifiable recognition of the reduction, avoidance or sequestration of carbon dioxide or other greenhouse gases as a result of carbon offset project"<sup>197</sup>, the word "credit" was discontinued in the official language of the climate negotiations after COP3 in favor of **emissions reduction units (ERUs)**, and **certified emissions reductions (CERs)**. "Credit" was a difficult term because it held a number of different technical meanings and connotations in different languages -- making negotiations on issues involving GHG "credits" confusing.

## D

## Deforestation

The removal of forest stands by cutting and burning to provide land for agricultural purposes, residential or industrial building sites, roads, etc., or by harvesting the trees for building material or fuel.<sup>198</sup>

## Discounting

A method used by economists to determine the dollar value today of a project's future costs and benefits. This is done by weighing money values that occur in the future by a value less than 1, or "discounting" them. Because environmental decision makers are increasingly forced to evaluate policies with costs and benefits that will be spread over tens - perhaps hundreds - of years, discounting is used to help evaluate the value of measures that deal with problems such as stratospheric ozone depletion and global climate change.<sup>199</sup>

## Double Dividend

The notion that environmental taxes can both reduce pollution (the first dividend) and reduce the overall economic costs associated with the tax system by using the revenue generated to displace other more distortionary taxes that slow economic grow at the same time (the second dividend).<sup>200</sup>

## E

## Economies in Transition

See Countries with Economies in Transition

## Emissions

<sup>194</sup> UNFCCC: <http://www.unfccc.org/siteinfo/glossary.html>

<sup>195</sup> UNFCCC: <http://www.unfccc.org.siteinfo/glossary.html>

<sup>196</sup> UNFCCC: <http://www.unfccc.org/siteinfo/glossary.html>

<sup>197</sup> Figueres, Christiana, Ann Hambledon et al. *Implementing JI/AJ: A Guide for Establishing Joint Implementation Programs*. Center for Sustainable Development in the Americas, 1996

<sup>198</sup> IPCC. Special report on emissions scenarios. 2000.

<sup>199</sup> Resources for the Future:

<http://www.weathervane.rff.org/glossary/index.html>

<sup>200</sup> Resources for the Future:

<http://www.weathervane.rff.org/glossary/index.html>

**Emissions Trading**  
The release of GHGs and/or their precursors (pollutants) into the atmosphere over a specified area and period of time. Emissions can also be released into waterways (streams, oceans, etc.).<sup>201</sup>

**Emissions Budgets**  
See Assigned amounts

#### **Emission Permit**

A non-transferable, non-tradable allocation of entitlement by a government to an individual firm to emit a specified amount of a substance.<sup>202</sup>

#### **Emission Quota**

The portion or share of total allowable emissions assigned to a country or group of countries within a framework of maximum total emissions and mandatory allocations of resources or assessments.<sup>203</sup>

#### **Emission Reduction Units (ERUs)**

Emissions reduction units (ERUs) are units of Greenhouse Gas reductions (or, portion of a country's Assigned Amount) that have been generated via Joint Implementation under Article 6 of the Kyoto Protocol - as opposed to Certified Emission Reduction units (CERs) - which have been generated and certified under the provisions of Article 12 of the Kyoto Protocol, the Clean Development Mechanism.<sup>204</sup>

#### **Emission Standard**

A level of emission that, under law, cannot be exceeded.<sup>205</sup>

**Emissions Trading**  
The Kyoto Protocol, in Article 17, establishes a mechanism whereby (Annex I) Parties with emissions commitments may trade their emission allowances with other (Annex I) Parties. The aim is to improve to overall flexibility and economic efficiency of making emissions cuts.<sup>206</sup>

**Environmental Integrity Group**  
Composed of Switzerland, South Korea, and Mexico.

#### **European Union (EU)**

As a regional economic integration organization, the European Union can be and is a Party to the Convention; however, it does not have a separate vote from its members. The EU can also be a Party to the Protocol. Because it signed the Convention when it was known as the EEC, it retains this name for all formal Convention-related purposes. Its members are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the UK.<sup>207</sup>

#### **Executive Board**

The Executive Board of the CDM is established in Article 12 of the Kyoto Protocol. Although many of the functions, makeup and terms of the executive board are still to be determined, the main role is to supervise the CDM and oversee the operational entities, which "certify" certified emission reductions.

## F

<sup>201</sup> IPCC. Special report on emissions scenarios. 2000.

<sup>202</sup> U.S. Country Studies /Initiative for Joint Implementation Glossary of Commonly Used Terms, 1997

<sup>203</sup> U.S. Country Studies /Initiative for Joint Implementation Glossary of Commonly Used Terms, 1997

<sup>204</sup> Kyoto Protocol:

<http://www.unfccc.int/resource/docs/convkp/kpeng.pdf>

<sup>205</sup> IPCC. Special report on methodological and technological issues in technology transfer. 2000

#### **Financial Mechanism**

As defined by the Convention, its role is to transfer funds and technologies to developing countries on a grant or concessional

<sup>206</sup> UNFCCC: <http://www.unfccc.org.siteinfo/glossary.html>

<sup>207</sup> UNFCCC: <http://www.unfccc.org/siteinfo/glossary.html>

basis, under the guidance of the COP. The Global Environment Facility is “operating” the mechanism on an interim basis.<sup>208</sup>

## Flexibility Mechanisms

Refers to the three cooperative implementation mechanisms under the Kyoto Protocol (Joint Implementation, international Emissions Trading and Clean Development Mechanism) including the notion of differentiated commitments.

## Fluorocarbons

Carbon-fluorine compounds that often contain other elements such as hydrogen, chlorine, or bromine. Common fluorocarbons include chlorofluorocarbons and related compounds (ozone depleting substances), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs).<sup>209</sup>

## Forest

Ecological systems with a minimum of 10% crown coverage of trees and/or bamboos, generally associated with wild flora, fauna and natural soil conditions, and not subject to agricultural practices.<sup>210</sup>

## Fossil Fuels

Carbon-based fuels, including coal, oil and natural gas and their derived fuels such as gasoline, synthesis gas from coal, etc.<sup>211</sup> Combustion of fossil fuels not only results in the liberation of carbon dioxide into the atmosphere but its by-products (unburned hydrocarbons and carbon monoxide) can oxidize to carbon dioxide.

## Fugitive Emissions

Fugitive emissions are intentional or unintentional releases of gases from anthropogenic activities such as the processing, transmission or transportation of gas or petroleum. In particular, they may arise from the production, processing, transmission, storage and use of fuels, and include emissions from combustion only where it does

not support a productive activity (e.g., flaring of natural gases at oil and gas production facilities).<sup>212</sup>

## Fungibility

The inter-changeability of the emission reduction credits among the mechanisms.<sup>213</sup>

## G

## General Circulation Model (GCM)

A global, three-dimensional computer model of the climate system, which can be used to simulate human-induced climate change. GCMs are highly complex and they represent the effects of such factors as reflective and absorptive properties of atmospheric water vapor, greenhouse gas concentrations, clouds, annual and daily solar heating, ocean temperatures and ice boundaries. The most recent GCMs include global representations of the atmosphere, oceans, and land surface.<sup>214</sup>

## Global Environmental Facility (GEF)

The multi-billion-dollar GEF was established by the World Bank, the UN Development Programme, and the UN Environment Programme in 1990. It operates the Convention’s “financial mechanism” on an interim basis and funds developing country projects that have global climate change benefits.<sup>215</sup>

## Global Warming

An increase in the near surface temperature of the Earth. Global warming has occurred in the distant past as the result of natural influences, but the term is most often used to refer to the warming

<sup>212</sup> IPCC Glossary: <http://www.ipcc.ch/pub/gloss.pdf>

<sup>213</sup> CSDA/UNDP. *Negotiator's Guide to the Chairman's Text on the Mechanisms of the Kyoto Protocol*. August 18, 2000

<sup>214</sup> IPCC. Special report on methodological and technological issues in technology transfer. 2000.

<sup>215</sup> UNFCCC: <http://www.unfccc.org/siteinfo/glossary.html>

predicted to occur as a result of increased emissions of greenhouse gases.<sup>216</sup>

to harmonize the negotiating positions of its 133 developing-country members.<sup>221</sup>

## Global Warming Potential (GWP)

Index created in the Kyoto Protocol that allows for equal comparison of the various greenhouse gases. It is the radiative forcing that results from the addition of 1 kilogram of a gas to the atmosphere compared to equal mass of carbon dioxide. Over 100 years, methane has a GWP of 21 and nitrous oxide of 310.

## Greenhouse Effect

The effect produced as greenhouse gases allow incoming solar radiation to pass through the Earth's atmosphere, but prevent most of the outgoing long-wave infra-red radiation from the surface and lower atmosphere from escaping into outer space.<sup>217</sup> This envelope of heat-trapping gases keeps the Earth about 30°C warmer than if these gases did not exist.<sup>218</sup>

## Greenhouse Gases (GHGs)

Any gas that absorbs and re-emits infrared radiation into the atmosphere.<sup>219</sup>

## GHG Reduction Potential

Possible reductions in emissions of GHGs (quantified in terms of absolute reductions of in percentages of baseline emissions) that could be achieved through the use of technologies and measures.<sup>220</sup>

## Group of 77 and China

The G-77 was founded in 1967 under the auspices of the United Nations Conference for Trade and Development (UNCTAD). It seeks

## H

### Host country

The country where the reduction, avoidance or sequestration of greenhouse gas takes place.

## "Hot Air"

Term developed by the NGO community to describe the difference in emissions reductions according to the established base year agreed to under the Kyoto Protocol, and actual emissions reductions as a result of reasons unrelated to climate mitigation, such as changes in the economies of Russia and other economies in transition. Since the **base year** of 1990, political and economic circumstances such as the reunification of Germany and the dissolution of the Soviet Union have resulted in emission trajectories in some countries that put expected emissions well below their **assigned amounts** under Annex B.

For example, since 1990, former Eastern Bloc countries have upgraded their energy generation and industrial processes significantly -- thereby resulting in much lower emission levels. In the case of Germany, this excess has been counted within the EU "bubble". Russia, and other former Soviet republics, however, will have excess emission reductions without taking any domestic action and will be able to meet targets without making investments in new emissions reductions. Without a trading scenario in place, this would not be an issue, but under a trading regime, the country "owning" these excess reductions, or "hot air", could sell them to countries not complying with their reduction targets.

<sup>216</sup> IPCC. Special report on methodological and technological issues in technology transfer. 2000.

<sup>217</sup> IPCC. Special report on methodological and technological issues in technology transfer. 2000.

<sup>218</sup> IPCC. Special report on emissions scenarios. 2000.

<sup>219</sup> IPCC. Special report on emissions scenarios. 2000.

<sup>220</sup> IPCC. Special report on emissions scenarios. 2000.

The heat energy that is emitted from all solids, liquids, and gases. In the context of the greenhouse issue, the term refers to the heat energy emitted by the Earth's surface and its atmosphere. **Greenhouse Gases** strongly absorb this radiation in the Earth's atmosphere, and reradiate some back towards the surface, creating the greenhouse effect.<sup>222</sup>

## J

### Joint Implementation (JI)

The Kyoto Protocol establishes a mechanism whereby a developed country can receive "emissions reductions units" when it helps to finance projects that reduce net emissions in another developed country (including countries with economies in transition). Some aspects of this approach are being tested as Activities Implemented Jointly.<sup>223</sup>

### Intergovernmental Panel on Climate Change (IPCC)

The INC met during five sessions between February 1991 and May 1992 to draft the Convention; it met six more times to prepare for COP1 before completing its work in February 1995.<sup>224</sup>

### Intergovernmental Panel on Climate Change (IPCC)

The IPCC was established in 1988 by the World Meteorological Organization and the UN Environment Programme. It conducts rigorous surveys of the worldwide technical and scientific literature and publishes assessment reports that are widely recognized as the most credible existing sources on climate change. The IPCC also works on methodologies and responds to specific requests from the Convention's subsidiary bodies.<sup>224</sup>

## International emissions trading

### See Emissions trading

### Inventory

Typically, a national inventory is the register of sources and sinks of greenhouse gases in a particular country. The UNFCCC calls for all Parties to commit to "develop, update periodically, publish and make available to the Conference of the Parties (COP) their national inventories of anthropogenic emissions by sources and removals by sinks of all **Greenhouse Gases** not controlled by the **Montreal Protocol** and, to "use comparable methodologies for inventories of GHG emissions and removals".<sup>225</sup>

### JUSSCANNZ

The non-EU industrialized countries meet as a group to discuss various issues; they are Japan, the US, Switzerland, Canada, Australia, Norway, and New Zealand. Iceland, Mexico, and the Republic of Korea may also attend meetings.<sup>226</sup>

## K

### Kyoto Mechanisms

Economic mechanisms based on market principles that Parties to the Kyoto Protocol can use in an attempt to lessen the potential economic impacts of GHG emission-reduction requirements. They include Joint Implementation (Article 6), the Clean Development Mechanism (Article 12) and Emissions Trading (Article 17).<sup>228</sup>

### The Kyoto Protocol

The Protocol, drafted during the Berlin Mandate process, on entry into force, would require countries listed in its Annex B (developed nations) to meet differentiated reduction targets for their GHG emissions relative to 1990 levels by 2008-2012. It was adopted by

<sup>222</sup> IPCC. Special report on methodological and technological issues in technology transfer. 2000.

<sup>223</sup> UNFCCC: <http://www.unfccc.int/siteinfo/glossary.html>

<sup>224</sup> UNFCCC: <http://www.unfccc.org/siteinfo/glossary.html>

<sup>225</sup> UNFCCC: <http://www.unfccc.org.siteinfo/glossary.html>

all Parties to the Climate Convention in Kyoto, Japan, in December 1997.<sup>229</sup>

## L

### **Market Potential**

The portion of the economic potential for GHG emission reduction or energy-efficiency improvements that could be achieved under existing market conditions, assuming no new policies and measures.<sup>233</sup>

## Leakage

Leakage is the indirect effect of emission reduction policies or activities that lead to a rise in emissions elsewhere (e.g. fossil fuel substitution leads to a decline in fuel prices and a rise in fuel use elsewhere). For land use change and forestry activities, leakage can be defined as the unexpected loss of estimated net carbon sequestered. Specific to CDM/AJ/JI projects in both forestry and energy sectors, leakage can be a result of unexpected effects including unforeseen circumstances, improperly defined baseline, improperly defined project lifetime or project boundaries, and inappropriate project design.<sup>230</sup>

## M

### **Market Barriers**

In the context of climate change, this refers to conditions (such as policy and legal frameworks) that impede the diffusion of cost-effective technologies or practices that could mitigate GHG emissions.<sup>231</sup>

### **Market-Based incentives**

In the context of climate change, this refers to measures (such as subsidies, taxes, emissions trading) intended to directly change relative prices of "climate -friendly" technologies in order to overcome market barriers.<sup>232</sup>

### **Methane ( $\text{CH}_4$ )**

One of the six GHGs to be mitigated under the Kyoto Protocol, it has a relatively short atmospheric lifetime ( $10\pm2$  years). Primary sources of methane are landfills, coal mines, paddy fields, natural gas systems and livestock (e.g. cows and sheep). It has a GWP of 21 (over a 100 year time horizon).<sup>234</sup>

### **Measures**

Actions that can be taken by a government or a group of governments, often in conjunction with the private sector, to accelerate the use of technologies or other practices that reduce GHG emissions.<sup>235</sup>

### **Mitigation**

An anthropogenic intervention to reduce the emissions or enhance the sinks of greenhouse gases.<sup>236</sup>

## N

### **Nitrogen Oxides (NOx)**

Gases consisting of one molecule of nitrogen and varying numbers of oxygen atoms. Nitrogen oxides are produced in the emissions of vehicle exhausts and from power stations. In the atmosphere,

<sup>229</sup> IPCC. Special report on emissions scenarios. 2000.

<sup>230</sup> Environmental Defense Fund. Conservation, Forestry, Land Use and Carbon Sequestration, 1998

<sup>231</sup> U.S. Country Studies /Initiative for Joint Implementation Glossary of Commonly Used Terms, 1997  
<sup>232</sup> U.S. Country Studies /Initiative for Joint Implementation Glossary of Commonly Used Terms, 1997

<sup>233</sup> IPCC. Special report on emissions scenarios. 2000.  
<sup>234</sup> IPCC. Special report on emissions scenarios. 2000.  
<sup>235</sup> IPCC. Special report on emissions scenarios. 2000.  
<sup>236</sup> IPCC. Special report on methodological and technological issues in technology transfer. 2000.

nitrogen oxides can contribute to the formation of photochemical ozone (smog), which is a greenhouse gas.<sup>237</sup>

## Nitrous Oxide ( $\text{N}_2\text{O}$ )

A powerful greenhouse gas emitted through soil cultivation practices, especially the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning.<sup>238</sup> This GHG is listed in Annex A of the Kyoto Protocol.

## No-regrets Mitigation Options

Measures whose benefits - such as improved performance or reduced emissions of local/regional pollutants, but excluding the benefits of climate change mitigation - equal or exceed their costs. They are sometimes known as "measures worth doing anyway".<sup>239</sup>

## Non-Governmental Organizations (NGOs)

Many relevant NGOs attend the climate talks as observers in order to interact with delegates and the press and provide information. NGOs must be non-profit and can include environmental groups, research institutions, business groups, and associations of urban and local governments.<sup>240</sup>

Netherlands, New Zealand, Norway, Poland, Portugal, Spain,<sup>241</sup> Sweden, Switzerland, Turkey, the UK, and the United States.

## Ozone ( $\text{O}_3$ )

Ozone in the troposphere, or lower part of the atmosphere, can be a constituent of smog and acts as a GHG. It is created naturally and also by reactions in the atmosphere that involve gases resulting from human activities, including nitrogen oxides ( $\text{NO}_x$ ), from motor vehicles and power plants. The Montreal Protocol seeks to control chemicals that destroy ozone in the stratosphere (upper part of the atmosphere), where the ozone absorbs ultra-violet radiation.<sup>242</sup>

## P

## Party

A state (or regional economic integration organization such as the EU) that agrees to be bound by a treaty and for which the treaty has entered into force.<sup>243</sup>

## Permit

A marketable instrument conferring a quantified emissions allowance during a specific time-frame.<sup>244</sup>

## O

## OECD

The Organization for Economic Cooperation and Development consists of Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Republic of Korea, Japan, Luxembourg, Mexico, the

## Policies and Measures

<sup>237</sup> IPCC. Special report on methodological and technological issues in technology transfer. 2000.

<sup>238</sup> IPCC. Special report on methodological and technological issues in technology transfer. 2000.

<sup>239</sup> IPCC. Special report on methodological and technological issues in technology transfer. 2000

<sup>240</sup> UNFCCC: <http://www.unfccc.org/siteinfo/glossary.html>

<sup>241</sup> UNFCCC: <http://www.unfccc.org/siteinfo/glossary.html>

<sup>242</sup> IPCC. Special report on emissions scenarios. 2000.

<sup>243</sup> UNFCCC: <http://www.unfccc.org/siteinfo/glossary.html>

<sup>244</sup> Grubb, Michael et al. *The Kyoto Protocol: A Guide and Assessment*. RIIA 1999

<sup>245</sup> IPCC. Special report on methodological and technological issues in technology transfer. 2000.

Countries must decide what policies and measures to adopt in order to achieve their emissions targets. Some possible policies and measures, which Parties could implement, are listed in the Kyoto Protocol and could offer opportunities for intergovernmental cooperation.<sup>246</sup>

Verification refers to the assessment of whether the calculated GHG reductions from a project actually occurred. Verification is essentially an audit performed by a certified third party.<sup>249</sup>

## **Polluter pays**

The principle which states that those who cause industrial pollution should offset its effects by compensating for the damage incurred,<sup>247</sup> or by taking precautionary measures to avoid creating pollution.

## **Precautionary Principle**

From the UNFCCC (Article 3): "Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures taking into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost."<sup>248</sup>

## **Project Assessment**

Assessing AIJ or JI projects involves the following tasks:  
Monitoring refers to the measurement and calculation of GHG emissions reductions and other impacts that occur as a result of the project.

Evaluation entails a more detailed analysis of project impacts than emissions monitoring. It involves both impact and process evaluation.

Reporting refers to the provision of information on measured project GHG and non-GHG impacts.

## **Q**

### **Quantified Emissions Limitation and Reduction Commitments (QELRCs)**

Legally-binding targets and timetables under the Kyoto Protocol for the limitation or reduction of greenhouse gas emissions for developed countries.<sup>250</sup> Also referred to as Quantified Emissions Limitation and Reduction Objectives (QELROs).

## **R**

### **Radiative Forcing**

A change in the balance between incoming solar radiation and outgoing infrared radiation. Without any Radiative forcing, solar radiation coming to the Earth would continue to be approximately equal to the infrared radiation emitted from the Earth. The addition of greenhouse gases traps an increased fraction of the infrared radiation, reradiating it back toward the surface and creating a warming influence (i.e., positive radiative forcing because incoming solar radiation will exceed outgoing infra-red radiation).<sup>251</sup>

## **Ratification**

After signing the Convention or the Protocol, a country must ratify it, often with the approval of its parliament or other legislature. The instrument of ratification must be deposited with the

<sup>246</sup> UNFCCC: <http://www.unfccc.int/siteinfo/glossary.html>

<sup>247</sup> Resources for the Future:  
<http://www.weathervane.rff.org/glossary/index.html>

<sup>248</sup> UN Framework Convention on Climate Change. Article 3.

<sup>249</sup> U.S. Country Studies/Initiative for Joint Implementation Glossary of Commonly Used Terms, 1997

<sup>250</sup> UNFCCC: <http://www.unfccc.org.siteinfo/glossary.html>

<sup>251</sup> IPCC. Special report on Methodological and technological issues in technology transfer. 2000.

depository (in this case the UN Secretary-General) to start the 90-day countdown to becoming a Party.<sup>252</sup>

### **Reforestation**

**Reforestation, Afforestation and Deforestation** are specifically mentioned in Article 3.3 of the Kyoto Protocol as activities that must be considered in the calculation of **Carbon Stocks**. This term is defined in the Glossary of the IPCC methodology for National Greenhouse Gas Inventories as "Planting of forests on lands which have, historically, previous contained forests but which have been converted to some other use".<sup>253</sup>

### **Regional Groups**

The five regional groups meet privately to discuss issues and nominate bureau members and other officials. They are Africa, Asia, Central and Eastern Europe (CEE), Latin America and the Caribbean (GRULAC), and the Western Europe and Others Group (WEOG).<sup>254</sup>

### **Renewables**

Energy sources that are, within a short timeframe relative to the Earth's natural cycles, sustainable, and include non-carbon technologies such as solar energy, hydropower and wind as well as carbon-neutral technologies such as biomass.<sup>255</sup>

### **Review of Commitments**

The Parties must regularly review the adequacy of the Convention's Article 4.2 (a) and (b) outlining developed country commitments to limit emissions. The first review took place at COP-1 and led to the Berlin Mandate and the adoption of the Kyoto Protocol. The second review took place at COP-4, 1998 in Buenos Aires.<sup>256</sup>

## **S**

### **Second Assessment Report (SAR)**

Also known as Climate Change 1995, the IPCC's SAR was written and reviewed by some 2,000 scientists and experts worldwide. It concluded, "the balance of evidence suggests that there is a discernible human influence on global climate" and confirmed the availability of "no-regrets" options and other cost-effective strategies for combating climate change.<sup>257</sup>

### **Secretariat**

Staffed by international civil servants and responsible for servicing the COP and ensuring its smooth operation, the secretariat makes arrangements for meetings, compiles and prepares reports, and coordinates with other relevant international bodies. The Climate Change secretariat is institutionally linked to the United Nations.<sup>258</sup>

### **Sequestration**

The capacity to absorb carbon dioxide out of the air through the process of photosynthesis.

### **Sinks**

Under the Kyoto Protocol, developed countries can include changes in net emissions (calculated as emissions minus removals of CO<sub>2</sub>) from certain activities in the land-use change and forestry sector. Calculating the effects of sinks (growing vegetation tends to absorb carbon dioxide from the atmosphere) is methodologically complex and still needs to be clarified.<sup>259</sup>

### **Solar Radiation**

Radiation emitted by the Sun. Also known as short-wave radiation. Solar radiation has a distinctive spectrum (i.e., range of wavelengths) governed by the temperature of the Sun. The spectrum of solar radiation is practically distinct from that of infrared (q.v.) or terrestrial radiation because of

<sup>252</sup> UNFCCC: <http://www.unfccc.org.siteinfo/glossary.html>

<sup>253</sup> IPCC Glossary: <http://www.ipcc.ch/pub/gloss.pdf>

<sup>254</sup> UNFCCC: <http://www.unfccc.org/siteinfo/glossary.html>

<sup>255</sup> IPCC. Special report on Emissions scenarios. 2000.

<sup>256</sup> UNFCCC: <http://www.unfccc.org.siteinfo/glossary.html>

the difference in temperature between the Sun and the Earth-atmosphere system.<sup>260</sup>

#### **Subsidiary Body**

A committee that assists the Conference of the Parties. Two permanent ones are defined by the Convention: the Subsidiary Body for Implementation (SBI) and the Subsidiary Body for Scientific and Technological Advice (SBSTA). COP-1 also established two other temporary bodies: the Ad hoc Group on the Berlin Mandate, which concluded its work on 30 November 1997, and the Ad hoc Group on Article 13. Additional subsidiary bodies may be established as needed.<sup>261</sup>

#### **Subsidiary Body for Implementation (SBI)**

Makes recommendations on policy and implementation issues to the COP and, if requested, other bodies.<sup>262</sup>

#### **Subsidiary Body for Scientific and Technological Advice (SBSTA)**

Serves as the link between the information and assessment provided by expert sources (such as the IPCC) on the one hand, and the policy-oriented needs of the COP on the other.<sup>263</sup>

#### **Sulfur hexafluoride (SF<sub>6</sub>)**

One of the six GHGs to be curbed under the Kyoto Protocol. It is largely used in heavy industry to insulate high-voltage equipment and to assist in the manufacturing of cable cooling systems. It has a large GWP (23 900 times that of CO<sub>2</sub> over a 100 year horizon).<sup>264</sup>

#### **Supplementarity**

Article 17 specifies that trading be "supplemental" to domestic actions for the purpose of meeting **quantified emission limitation and reductions** under that article. According to one point of view,

supplementarity should be implemented by imposing a cap, or fixed numerical restriction, on the quantity of emissions reductions that can be achieved internationally, as opposed to via domestic actions and policies. The theory behind this perspective is that, in the absence of pressure to change production and consumption patterns at home, countries with high energy intensities will not have an incentive to spur innovation and adopt new, cleaner technologies and practices.

#### **Sustainable Development**

Sustainable Development is a broad concept referring to the need to balance the satisfaction of near-term interests with the protection of the interests of future generations, including their need for a safe and healthy environment. As expressed by the 1987 UN World Commission on Environment and Development (the "Brundtland Commission"), sustainable development "meets the needs of the present without compromising the ability of future generations to meet their needs".

## **T**

#### **Technology Transfer**

The broad set of processes covering the exchange of knowledge, money and goods amongst different stakeholders that lead to the spreading of technology for adapting to or mitigating climate change. In an attempt to use the broadest and most inclusive concept possible, the Report (IPCC) uses the word 'transfer' to encompass both diffusion of technologies and cooperation across and within countries.<sup>265</sup>

#### **Third Assessment Report (TAR)**

The IPCC's Third Assessment Report was finalized in late 2000 and published July, 2001. It is a comprehensive assessment of the policy-relevant scientific, technical and socio-economic dimensions of climate change.<sup>266</sup>

<sup>260</sup> IPCC: <http://www.ipcc.ch/pub/gloss.pdf>

<sup>261</sup> UNFCCC: <http://www.unfccc.org/siteinfo/glossary.html>

<sup>262</sup> UNFCCC: <http://www.unfccc.int/siteinfo/glossary.html>

<sup>263</sup> UNFCCC: <http://www.unfccc.int/siteinfo/glossary.html>

<sup>264</sup> IPCC. Special report on Emissions scenarios. 2000.

## **U**

### **Umbrella Group**

The Umbrella Group, which emerged at Kyoto and afterwards, brings the JUSSCANNZ countries except Switzerland together with the Russian Federation and Ukraine.<sup>267</sup>

### **United Nations Framework Convention on Climate Change (UNFCCC)**

A treaty signed at the 1992 Earth Summit in Rio de Janeiro by more than 150 countries. Its ultimate objective is the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system". While no legally binding level of emissions is set, the treaty states an aim by Annex I countries to return these emissions to 1990 levels by the year 2000. The treaty took effect in March 1994 upon the ratification of more than 50 countries; a total of some 160 nations have now ratified. In March 1995, the UNFCCC held the first session of the COP, the supreme body of the Convention, in Berlin. Its Secretariat is based in Bonn, Germany. In the biennium 2000-01, its approved budget and staffing level are approximately US\$12 million annually with approximately 80 personnel.<sup>268</sup>

## **V**

### **Validation**

The process of independent evaluation of a project activity by an accredited independent entity.<sup>269</sup>

**Verification**  
Verification involves a third party checking that the emissions reductions claimed in the national and international registers or "books" have actually occurred and evaluating the results that have been achieved against pre-set criteria. Verification is a "reality check" on the books. It could involve physical, on-site inspection, or where useful, deployment of techniques such as remote sensing, or interviewing relevant personnel in person or otherwise. It could be applied to each and every project or to a fraction of projects chosen randomly or selected according to agreed criteria.<sup>270</sup>

## **Vulnerability**

The degree to which a system is susceptible to, and unable to cope with, injury damage or harm.<sup>271</sup>

## **Voluntary Commitments**

During the Kyoto negotiations, a draft article that would have permitted developing countries to voluntary adhere to legally binding emissions targets was dropped in the final hours. The issue remains important for some negotiators.<sup>272</sup>

## **Voluntary Measures**

Measures to reduce GHG emissions that are adopted by firms or other actors in the absence of government mandates. Voluntary measures help make climate-friendly products or processes more readily available or encourage consumers to incorporate environmental values in their market choices.<sup>273</sup>

## **V**

### **Water Vapor ( $H_2O$ )**

<sup>270</sup> Yamin, F.. "Issues and options for implementation of the Clean Development Mechanism", 1998.

<sup>271</sup> IPCC. Special report on Methodological and technological issues in technology transfer. 2000.

<sup>272</sup> UNFCCC: <http://www.unfccc.org/siteinfo/glossary.html>

<sup>273</sup> IPCC. Special report on Emissions scenarios. 2000.

Most abundant GHG. Anthropogenic activities are not significantly increasing its concentration, but warming leads to a positive water vapor feedback. The concentration of water vapor regulates the temperature of the planet, in part, because of its relationship with the atmosphere and the water cycle.

# Appendix II

Prepared by: Helena Olivas

---

## Existing National JI/CDM Programs in Latin America

---

### COSTA RICA

S.E. Sr. Franz Tattenbach Capra  
Embajador en Misión Especial  
Oficina Costarricense de Implementación Conjunta  
P.O. Box 7170-1000  
San José, COSTA RICA

[email:ocicgm@sol.racsac.cr](mailto:ocicgm@sol.racsac.cr)

Tel: (506) 220-0036 ext. 846

Fax: (506) 290-1238

---

### ECUADOR

Lourdes Barragán  
Ministerio de Medio Ambiente  
Avemida Eloy Alfaro y Amazonas  
Edif.del MAG 7 mo. Piso  
Quito, Ecuador  
Tel: (593) 256-3544  
Fax: (593) 256-5809

---

### EL SALVADOR

Ivette Aguiar  
Oficina de Desarrollo Limpio  
Ministerio de Medio Ambiente y Recursos Naturales  
Alameda Roosevelt y  
55 Av. Norte Torre El Salvador  
Edif. IPSFA 3er. Nivel  
San Salvador, El Salvador  
Tel: 503/ 260-5622  
Fax: 503/ 260-3113

---

### GUATEMALA

Ing. Eduardo Dopazo  
OGIC  
Diagonal 6 10-65, Zona 10  
Centro Gerencial Margaritas Torre 1  
4º Nivel Of. 402  
Guatemala 01010 Guatemala  
Tel: 502/332-7952  
Fax: 502/332-7958

---

### COLOMBIA

Dr. Thomas Black  
Ministerio del Medio Ambiente  
Calle 37 #8 - 40  
Piso 4  
Bogotá, Colombia  
Tel: 571/ 340-6279  
Fax: 571/ 288-9540

## **HONDURAS**

Sergio Zelaya

Director Ejecutivo

La Oficina de Implementación Conjunta y Mecanismo de Desarrollo

Limpio de Honduras (OICH)

5to. Piso Edif. Palmira

Tegucigalpa, M.D.C.  
Honduras, C.A.

Tel: 504/ 239-3631 or 232-1579

Fax: 504/

E-mail: [oich@sdnhon.org.hn](mailto:oich@sdnhon.org.hn)

## **MEXICO**

Biol. Julia Martínez

Directora de Cambio Climático Global

Instituto Nacional de Ecología

Av. Revolución 1425, nivel 31

Col. Tlacopac San Angel

Del. Álvaro Obregón

C.P. 01040, México D.F.

Tel: (52 5) 624-35-46

Fax: (52 5) 624-35-93

email: [jmartine@ine.gob.mx](mailto:jmartine@ine.gob.mx)

## **PANAMA**

Enrid Sopalda

Coordinadora Técnica, FUPASA

Autoridad Nacional del Ambiente

Edificio Deco Plaza, Planta Baja

Ave. Abel Bravo y Calle 59 Obarrio

Panamá

Tel: (507) 223-1531 // 223-1682

Fax: (507) 223-1477

[ipimen@sinfo.net](mailto:ipimen@sinfo.net)

## **PARAGUAY**

Celeste Acevedo

Oficina Paraguaya de Implementación Conjunta

Ruta 2, Km. 11  
Campus Universitario, San Lorenzo  
C.C. 1606 Asunción, Paraguay 1209  
Tel: (595-21) 585-610  
Fax: (595-21) 571-960  
E-mail: [jpinazzo@highway.py](mailto:jpinazzo@highway.py)

# Appendix III

## Project Design Document

A project activity to be [validated] [registered] shall be described in detail in a project design document approved by [each Party involved] [the host Party] and submitted to a designated operational entity.

*Note: Paragraph 1 merged with paragraph 3.*

The part of the project design document relating to the baseline shall provide the project [validator][registrar] with a complete understanding of the chosen baseline.

The content and structure of the project design document A project activity shall be described in detail in a project design document and shall include the following:

A letter from the designated national authority for CDM in [each Party involved] [the host Party] indicating formal acceptance of the proposed project activity, including in relation to aspects of sustainable development which, in the case of the host Party, states [how][that] the project assists the host country in achieving sustainable development;

A short objective non-technical summary of the purpose and context of the project;

A description of the project;

Project purpose;

[Policy and institutional context:

*Reference to the policy standards of the host country for the sectors involved;*

*Reference to the host country's legal framework and its degree of implementation;*

The social actors involved in the design and execution of projects;]

Technical description of the project and a description of the transfer of technology, including viability of technological choices;

Information regarding project location and its region;

*Brief description of the project boundaries (geo-referenced);*

Key parameters affecting future developments relevant to the baseline as well as the CDM project activity;  
[Optional]: Socio-economic aspects:  
Influence of the project on the socio-economic situation of the host Party and/or in the specific region in which the project is implemented;

Socio-economic impact of the project beyond its project boundaries, in the influence zone;  
Additional effects (indirect) of the execution and functioning of the project;]

Contribution to sustainable development, as defined in Agenda 21 and the relevant multilateral environmental agreements;

*Proposed baseline methodology;*

Description of the baseline calculation methodology chosen (in case of a [standardized] [multi-project] baseline, please indicate the relevant section of the [UNFCCC CDM reference manual]);

Justification that the proposed baseline methodology is appropriate;

*Justification of proposed crediting period;*

The estimated operational life of the project;

Any other information required to make fully transparent the application of the approved [standardized] [multi-project] baseline to the specific project;

Description of key parameters and assumptions used in baseline estimate;

*Project participants shall discuss to which extent national policies (especially distortionary policies such as energy subsidies, or incentives to forest clearing) influence the determination of the baseline. Data used for the*

*determination of baselines should be of the highest quality available;*

Data sources to be used to calculate the baseline anthropogenic emissions by sources[and/or anthropogenic removals by sinks], such as historic data on anthropogenic emissions by sources[and/or anthropogenic removals by sinks]variables and parameters used; Historic anthropogenic emissions by sources[and/or anthropogenic removals by sinks] for the activity, as appropriate; Projection of baseline emissions and emissions reduction by year over the operational life of the project; [Sensitivity analyses;]

Uncertainties [(in a quantitative manner, as applicable): Data; Assumptions; Key factors; Other; [Project boundaries][How the baseline methodology addresses potential project boundary issues.] Methodologies for the calculation of losses and leakage at the national and sub-national level and its liability assessment; In the case of a [new][first-of-a-kind] baseline methodology, describe strengths and weaknesses of the proposed baseline methodology; Other environmental impacts related to the project; All information relating to The executive summary of the environmental impact assessment, including social impacts as required under paragraph 68.

Conclusions on the proposed baseline methodology; [[For land-use, land-use change and forestry projects][For projects involving sequestration], a description of how the project participants will ensure crediting for a sinks projects reflects real, measurable and long-term benefits in enhancement of removals and/or avoidance of emissions of

greenhouse gases. For this purpose, the project design document shall include:

A proposed period of time during which carbon would remain sequestered; Modalities to address the possibility that some or all carbon sequestered through the project is released before the time specified in subparagraph (i) has elapsed, for example through modalities for ensuring that any carbon released before the specified time period has elapsed will be made up, or modalities regarding the rate at which CERs are issued over the duration of the project; and Modalities to address potential reversibility of carbon sequestration;]

[Economic and financial information:

Sources of financing and evidence that the funding is additional; [Financial and economic analysis (internal rate of return, reserve funds, financial flow); Estimates of the costs of implementation and maintenance of the project over its projected lifetime;]

Option 1: Additionality: Explanation of how the project activity meets the CDM additionality requirements

Option 2: Additionality of the project

(i) Funding resources including international and public funding

(ii) economic and financial assessment

(iii) technology assessment;

[Request for assistance in securing funding, if needed;]

Other information:

Comments observations and/or suggestions by local stakeholders and description of their involvement; Contribution to other environmental agreements (e.g. biodiversity, desertification), as applicable; Monitoring plan:

Relevant project performance indicators both within and outside the project boundary;

# Appendix IV

## National Criteria for Submission of CDM Projects

Although minor, gases used in refrigeration and air conditioning are major culprits in global warming. This is due to their enormous heating power, thousands of times greater than the mass equivalent of CO<sub>2</sub>. Unfortunately, their contribution has not been quantified in the GHG inventory, since they were not part of the initial list put out by the UNFCCC.

National mitigation options by sector are as follows:

### Energy

#### ARGENTINA

CDM (AJU) national project criteria defined by the OAC (Organización Argentina de Implementación Conjunta) Projects submitted to the OAC should be categorized AJU or CDM, as outlined under Decision 5 at COP 1 (Conference of Parties 1 under the UNFCCC). These are specific projects dealing with GHG mitigation either by emissions reductions and / or by the proliferation of sinks, implemented by an Annex 1 country either by a public or private entity and hosted in a non-Annex 1 country.

#### National sources and sinks of GHGs

On a global scale CO<sub>2</sub> emissions account for 60% of the total amount of GHG contributing to global warming. On a national level this contribution may be greater. CO<sub>2</sub> is the final product of fossil fuel burning, which is the most likely cause for greenhouse gas induced emissions from anthropogenic activities.

In Argentina, the energy sector is relatively modern and efficient, with a large hydro and a modest nuclear component. In order of importance, methane emissions account for the second greatest contribution to the greenhouse effect. Ninety per cent of methane emissions are produced by agricultural activities. Other sources include rice paddies, biomass decay and natural gas leaks. Finally, nitrous oxide emitted industrially from fertilizers and from land cover change to agriculture is the third greatest contributor to the greenhouse effect.

The bulk of fuel consumption lies in the generation of electricity. However, the focus of mitigation would not be based on increasing the efficiency of conventional thermoelectric generators, but in reducing GHG emissions by allowing the introduction of cleaner technologies (e.g. wind, solar) into the market. Within the conventional thermoelectric plants, an effort would be made to substitute highly contaminant fuels with cleaner fuels (e.g. gas substituting coal).

### Transport

Mitigation in this sector means implementing policy changes relative to the transport of passengers and cargo. This implies:

- 1) A change in the organization of transit: Improving highways and mass transit, as well as limiting the use of single-occupancy vehicles.
- 2) Cleaner transport mechanisms: Public transport replacing single cars, using trains instead of cargo trucks, and implementing subway systems decreasing the need for bus circulation.
- 3) Substituting emission sources: Promoting the use of less damaging fuels and decreasing the age of the public transit float.
- 4) A widespread use of cleaner engines and better techniques: For example, engines run by hydrogen combustion.

### Agriculture

Adopting new technologies in land use can reduce GHG emissions. For example, traditional tilling of the soil causes carbon emissions that are retained by the land. The change to minimum tillage greatly contributes to the reduction of such emissions.

#### **Residential, commercial and institutional buildings**

Mitigation of GHG emissions can be carried out by adopting technologies destined to reduce the energy consumed by equipment (appliances, heating, air conditioning, ventilation, lighting, etc.) and to optimize the thermal integrity of buildings, preventing the loss of energy through poor heating and ventilation.

Other measures to reduce emissions include: urban design and land use planning, the optimization of urban heating and ventilation systems, the implementation of sustainable construction techniques, and the use of renewable energy sources.

#### **Industry**

GHG emissions can be reduced by the adoption of cleaner technologies and the more efficient use of energy. Cogeneration, whereby two forms of usable energy are generated, is an example of more efficient energy consumption. The following techniques would be applied: a) "Topping", where the primary product of combustion is the generation of electrical-mechanical energy. The excess heat can be used for other processes (this technology can be applied to paper, textile, petroleum industries, etc.), b) "Bottoming", where the primary energy is heat applied to the industrial process and the secondary energy generated is mechanical and finally electrical (this technology can be applied to ceramic and metallurgical industries).

#### **Waste management**

The amount of methane produced from landfills can be mitigated by classifying and recycling waste. Also, installing a capture mechanism can collect methane. Captured methane can then be combusted and liberated into the atmosphere as CO<sub>2</sub>, which has a lesser greenhouse effect.

#### **Technology and measures to increase GHG sinks**

Basically, with the increase in photosynthetic activity atmospheric carbon dioxide is absorbed by leaves and converted to plant material. Photosynthetic activity can be increased by taking action in the forestry sector (promoting forestation and controlling deforestation), by expanding green areas of low irrigation in arid regions, and by augmenting the biomass density of lands by using better watering systems.

Land use changes and the control over native forests can contribute to the absorption of carbon dioxide. However, there are many uncertainties surrounding the measurable fixation of carbon dioxide, and studies concerning the carbon cycle and the evaluation of biomass in different ecosystems are required.

## **COLOMBIA**

Project Evaluation and Acceptance: The Colombian office will adhere to the regulations on CDM set forth by the COP, which will most likely include the criteria and methodologies to deal with baselines, additionality and sustainable development. Meanwhile, the Colombian office will define the criteria for the evaluation and approval of CDM projects as follows:

- Evaluation criteria: To establish the evaluation criteria and CDM project approval. These criteria should be approved by the Board of Directors and be consistent with the FCCC and the Kyoto Protocol.
- Evaluation procedures: To establish step-by-step procedures of evaluation of projects within a set time frame previously approved by the Board of Directors.
- Verification of Proposals (Prerequisites): To verify that the projects contain all required information and fulfill all entry prerequisites. To register the projects which fulfill the prerequisites.
- Evaluation (projects and baselines): To evaluate the projects with defined, clear and pre-established technical criteria, which have already been approved by the Board of Directors

- National approval: The office will concede national approval to projects that have fulfilled all criteria. Once the office has approved the project, it implies that the government of Colombia 1) authorizes that the CDM project can be carried out; 2) ensures that the project complies with the established approval criteria; 3) authorizes the exchange of certified emissions reductions generated under this project.
- Follow up: To keep an up-to-date account of projects registered with the office.

## COSTA RICA

### *Basic Project Considerations and Domestic Priorities*

1. Legal Compatibility

Is the project consistent with applicable Costa Rican laws and regulations?

2. Investor Home Acceptance

Is the project acceptable to the home country government, or does the project proponent intend to apply for such acceptance?

3. National Sustainable Development Priorities:

Is the project compatible with and supportive of Costa Rican national environment and development priorities and strategies, including:

Biodiversity conservation

Reforestation and forest conservation

Sustainable land use

Watershed protection

Air and water pollution reduction

Reduction of fossil fuel consumption

Will the local community support and participate in and/or benefit from the project?

### ***Environmental Feasibility***


Increased utilization of renewable resources

Enhanced energy efficiency

Does the project support for Costa Rica's efforts to fulfill its obligations under the UNFCCC, Biological Diversity and Agenda 21?

Does the project provide for enhancement of income opportunities and quality of life for Costa Rican civil society, including:

A minimized or acceptably low level of adverse consequences of the project through: site selection, scale adjustment, timing, attenuation, and mitigating measures.

Local capacity building, such as the transfer and adaptation of know-how and high quality technologies.

4. Local or Community Support

5. Greenhouse Gas Benefits

Will the project bring about real, measurable and long-term environmental benefits related to the mitigation of GHG that would not have occurred in the absence of such activities? The proposal should include a defensible reference or baseline case for emissions reductions or sequestration processes in the absence of the project.

#### **1. Offset Additionality**

Will the project have a monitoring plan that includes the participation of organizations capable of successfully monitoring the project? The monitoring plans should include actual measurements of the project's emissions or sequestration in order to establish a high degree of certainty that the predicted benefits were achieved by the project.

#### **2. Monitoring**

Does the project have a monitoring plan that includes the participation of organizations capable of successfully monitoring the project? The monitoring plans should include actual measurements of the project's emissions or sequestration in order to establish a high degree of certainty that the predicted benefits were achieved by the project.

#### **3. Verification**

Will the proposal allow for the verification of the project's progress through inspection by a qualified third party verifier?

#### **4. Durability or Quality of Offset**

Does the project have a high likelihood that the greenhouse gas offset will be maintained over the life of the project?

The proposal should include a work plan for project start-up and provide the timeline for starting or completing significant phases or stages of the project, including but not limited to: feasibility studies, development and beginning of operations, and completion of advanced stages of the project.

What methodologies were used to calculate greenhouse gas emissions reductions (avoidance) and carbon sequestration (fixation), and what are the key uncertainties affecting those estimates?

### ***Financial Feasibility***

#### **1. Financial Additionality**

Is the financing of the project additional to the financial obligations of Annex II Parties to the UNFCCC, as well as to the current Official Development Assistance flows (ODA)?

#### **2. Cost Estimates and Financial Feasibility**

Does the project include an account of all the costs of operation and economic benefits associated with the project, including organizations or entities, other than official project participants, that may contribute to the project's operation?

Does the project address the cost issue (in US\$) of the per avoided ton of CO<sub>2</sub> equivalent?

Do the project developers state the AJ financial component (in US\$)?

Does the proposal include the financial projections (cash flow, profitability, rate of return, benefit/cost relationship, etc.) with and without the AJ additional financial contribution?

Does the proposal address the issue of sharing the monetary surplus related with the projects GHG abatement benefits?

### ***Technical and Institutional Feasibility***

#### **1. Institutional Infrastructure and Governmental Role**

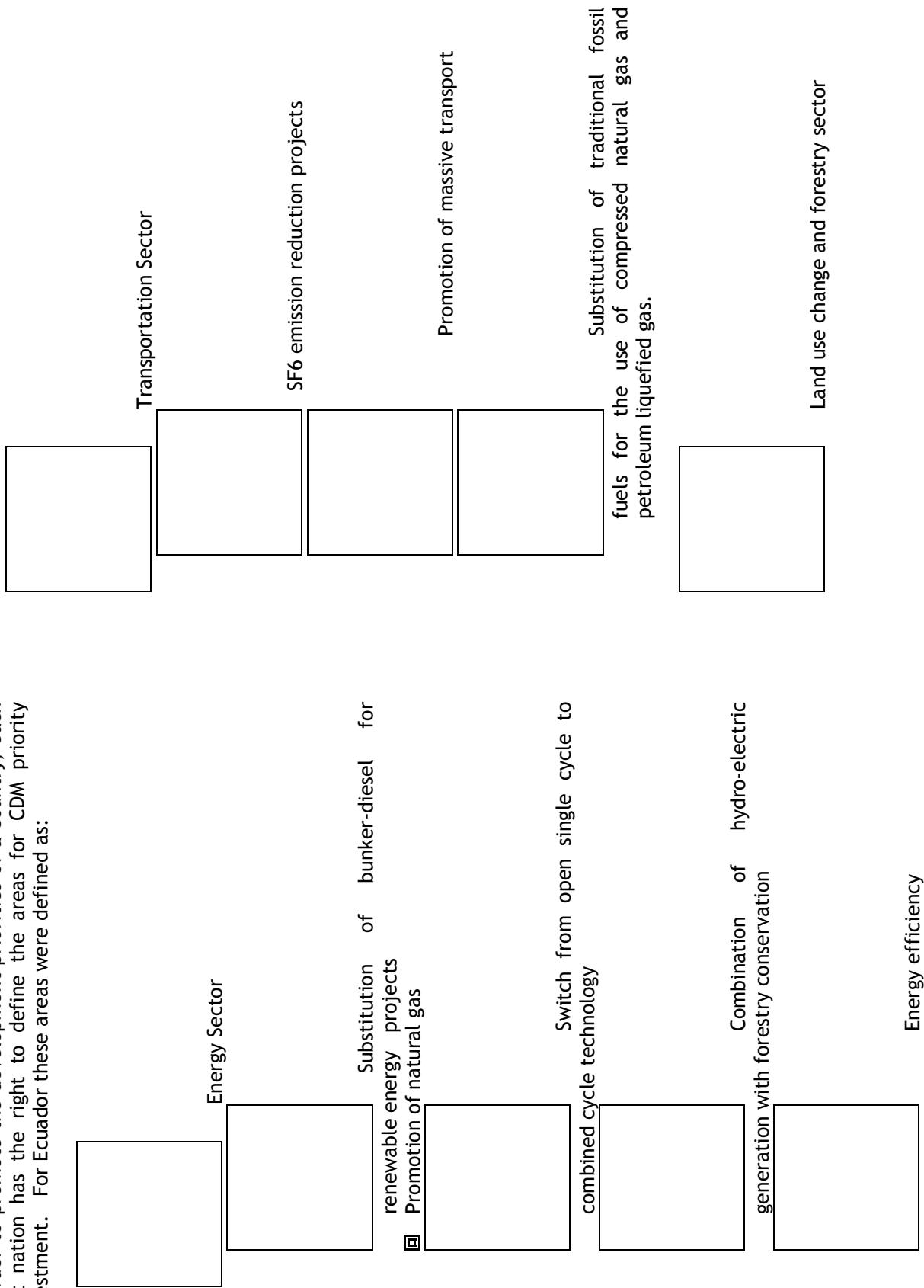
- |  |   |
|--|---|
| What methodologies were used to calculate greenhouse gas emissions reductions (avoidance) and carbon sequestration (fixation), and what are the key uncertainties affecting those estimates? | Does the domestic Costa Rican institutional framework (legal, administrative, and technological) exist to adequately implement and administer the project?  |
| <b>2. Reliability and Credibility of the Project Participants</b>  | What is the prior experience and track record of the project partner(s) and intermediaries? Is each partner's role in the project's development and implementation made explicit in the proposal? |

### ***ECUADOR***

National evaluation criteria are defined as follows:

<input type="checkbox"/>	Congruence with national development objectives and priorities	Sustainable development environmental strategy	Consistency with investment priority areas	the current legal
<input type="checkbox"/>				

In order to promote the development priorities of a country, each host nation has the right to define the areas for CDM priority investment. For Ecuador these areas were defined as:



The CDM project selection criteria are based on the following international negotiation criteria:

affected/benefited	Participation of community	Financial feasibility
development funds	Linkages with national social	Defined and project-based legal framework
		GHG mitigation potential
	Optimization of land use, in order to limit the advance of the agricultural frontier	Cost effective GHG reductions
		Project duplicability

## HONDURAS

### I. National Priorities

The OICH (Joint Implementation Office of Honduras) considers and packages CDM projects based on national priorities within the policies and framework related to climate change mitigation and adaptability processes. National and foreign project promoters and related activities should clearly base their project ideas on national socioeconomic criteria. Environmentally, all projects should comply with the obligations and environmental regulations as given by SERNA and municipal authorities, keeping biodiversity and water, land and forest conservation as priorities.

- II. Project selection based on socioeconomic, cultural and environmental criteria



Each project will contribute in the compilation of a national database to be used as a reference for similar projects carried out in other countries. The measurement and indicators that are generated will be incorporated into the National Environmental Information System. The analyses of said indicators and measurements will be critical in the comparison with the results obtained from project activities in other countries.

#### VII. Documentation

This step involves writing the project document. It contains the results of all studies previously undertaken. The document must also include the potential partners selected, an organizational chart and the defined responsibilities within the organization.

#### PANAMA

All projects presented for approval by FUPASA (Panamanian Foundation of Environmental Services) should contribute to Panama's overall sustainable development and mitigate the effects of GHG emissions by reducing and / or sequestering green house gases. The following criteria will be used to evaluate all projects:

##### 1. Institutional Policy:

Congruence with Panama's legal framework

Congruence with Panama's mandates on sustainable development by the sectors involved

The active involvement in the design and implementation of projects by all parties involved

Contribution to the country's institutional strengthening

Both Panama and the implementing organization must have the institutional capacity to execute the project

##### 2. Socio-economics:

The project must have direct influence in the socioeconomic situation of the area

	The effects and outcome of the project should be disseminated	A defined verification protocol
		The identification of other positive environmental effects as well as negative effects produced as a consequence of the project
	A clear definition of baselines and environmental additionality	4. Economic and Financial:
	A net effect: quantification of reduced or avoided GHG emissions and / or sequestered CO2	The internalization of implementation and project maintenance costs during the set time frame.
	Presentation of the quantifying methodology	A positive financial analysis, financial flux coming from funds.

## PARAGUAY

There is much uncertainty regarding Paraguay's potential to place project / certified emissions reductions in the market. The unknowns include: the type of GHG emissions reducing projects

that would be most cost-effective, the volume of GHG emissions reductions that would be feasible, and the market price of CER's.

To this date, the Committee and the Office have the following administrative and judicial tools to be used in the process of verification and certification of GHG emission reductions: an official decree to lay out a general framework of reference, a committee that regulates the decree, a national criteria for the creation of Carbon Projects and administrative procedures to receive, analyze and approve projects.

Proposed activities:

Printing informative material. For example, they foresee publishing a Manual of National Criteria and Procedures for the preparation and presentation of Carbon Projects. They foresee printing basic leaflet material targeted at different audiences: academia, government, private sector and the general public. The committee and the office will also publish an annual report and a strategic plan (2001)

Obtaining technical assistance in the revision of national criteria and administrative procedures.

Obtaining technical assistance to revise the document titled "Design of the best model for the entity to manage the financial resources coming from the Kyoto Protocol Flexibility Mechanisms, first approximation."

To obtain assistance in order to create a permanent technical and administrative revision system to manage carbon projects and certified emissions reductions.

To strengthen the Paraguayan Office's CDM/JI information system, establishing five networks to include user terminals, an Office website and an Office information system dealing with all project documentation.

## Appendix V

### Countries that have signed/ratified the Kyoto Protocol

Country	Signature	Ratification
<b>Antigua and Barbuda</b>	16/03/98	3/11/98
<b>Argentina</b>	16/03/98	28/09/01
<b>Australia</b>	29/04/98	
<b>Austria</b>	29/04/98	
<b>Azerbaijan</b>		28/09/00
<b>Bahamas</b>		9/04/99
<b>Barbados</b>		07/08/00
<b>Belgium</b>	29/04/98	
<b>Bolivia</b>	09/07/98	30/11/99
<b>Brazil</b>	29/04/98	
<b>Bulgaria</b>	18/09/98	
<b>Canada</b>	29/04/98	
<b>Chile</b>	17/06/98	
<b>China</b>	29/05/98	
<b>Cook Islands</b>	16/09/98	27/08/01
<b>Costa Rica</b>	27/04/98	
<b>Croatia</b>	11/03/99	
<b>Cuba</b>	15/03/99	
<b>Czech Republic</b>	23/11/98	
<b>Cyprus</b>		16/07/99
<b>Denmark</b>	29/04/98	
<b>Ecuador</b>	15/01/99	13/01/00
<b>Egypt</b>	15/03/99	
<b>Equitorial Guinea</b>		16/08/00
<b>El Salvador</b>	08/06/98	30/11/98
<b>Estonia</b>	03/12/98	
<b>European Community</b>	29/04/98	

<b>Fiji</b>		17/09/98	17/09/98
<b>Finland</b>		29/04/98	
<b>France</b>		29/04/98	01/06/01
<b>Gambia</b>			16/06/99
<b>Georgia</b>		29/04/98	
<b>Germany</b>		29/04/98	
<b>Greece</b>			05/10/99
<b>Guatemala</b>		10/07/98	07/09/00
<b>Guinea</b>			19/07/00
<b>Honduras</b>		25/02/99	
<b>Indonesia</b>		13/07/98	
<b>Ireland</b>		29/04/98	
<b>Israel</b>		16/12/98	
<b>Italy</b>		29/04/98	
<b>Jamaica</b>			28/06/99
<b>Japan</b>		28/04/98	
<b>Kazakhstan</b>		12/03/99	
<b>Kiribati</b>			07/09/00
<b>Latvia</b>		14/12/98	
<b>Lesotho</b>			06/09/00
<b>Liechtenstein</b>		29/06/98	
<b>Lithonia</b>		21/09/98	
<b>Luxembourg</b>		29/04/98	
<b>Malaysia</b>		12/03/99	
<b>Maldives</b>		16/03/98	30/12/98
<b>Mali</b>		27/01/99	
<b>Malta</b>		17/04/98	
<b>Maritius</b>			09/05/01
<b>Marshall Islands</b>		17/03/98	
<b>Mexico</b>		09/06/98	07/09/00
<b>Micronesia</b>		17/03/98	21/06/99
<b>Monaco</b>		24/04/98	
<b>Mongolia</b>			15/12/99
<b>Nauru</b>			16/08/01
<b>Netherlands</b>		29/04/98	
<b>New Zealand</b>		22/05/98	
<b>Nicaragua</b>		07/07/98	18/11/99
<b>Niger</b>		23/10/98	

<b>Niue</b>	8/12/98	29/04/98	06/05/99
Norway		29/04/98	
<b>Palau</b>		10/12/99	
<b>Panama</b>	08/06/98	05/03/99	
Papua New Guinea	02/03/99		
<b>Paraguay</b>	25/08/98	27/08/99	
Peru	13/11/98		
Philippines	15/04/98		
Poland	15/07/98		
Portugal	29/04/98		
Republic of Korea	25/09/98		
<b>Romania</b>	05/01/99	19/03/01	
The Russian Federation	11/03/99		
Saint Lucia	16/03/98		
Saint Vincent and the Grenadines	19/03/98		
<b>Samoa</b>	16/03/98	27/11/00	
<b>Senegal</b>		20/07/01	
Seychelles	20/03/98		
Slovakia	26/02/99		
Slovenia	21/10/98		
Solomon Islands	29/09/98		
Spain	29/04/98		
Sweden	29/04/98		
Switzerland	16/03/98		
Thailand	02/02/99		
<b>Trinidad and Tobago</b>	07/01/99	28/01/99	
<b>Turkmenistan</b>	28/09/98	11/01/99	
<b>Tuvalu</b>	16/11/98	16/11/98	
Ukraine	15/03/99		
United Kingdom	29/04/98		
United States of America	12/11/98		
<b>Uruguay</b>	29/07/98	05/02/01	
<b>Uzbekistan</b>	20/11/98	12/10/99	
<b>Vanuatu</b>		17/07/01	
Vietnam	03/12/98		
Zambia	05/08/98		
<b>TOTAL</b>	<b>84</b>	<b>40</b>	

Romania*	92
Russian Federation*	100
Slovakia*	92
Spain	92
Sweden	92
Switzerland	92
Ukraine*	100
United Kingdom and Northern Ireland	92
United States of America	93

\* Countries that are undergoing the process of transition to a market economy.

Country	Quantified emission limitation or reduction commitment (% of base year or period)
Australia	108
Austria	92
Belgium	92
Bulgaria*	92
Canada	94
Croatia*	95
Czech Republic*	92
Denmark	92
Estonia*	92
European Community	92
Finland	92
France	92
Germany	92
Greece	92
Hungary*	94
Iceland	110
Ireland	92
Italy	92
Japan	94
Latvia*	92
Liechtenstein	92
Lithuania*	92
Luxembourg	92
Monaco	92
Netherlands	92
New Zealand	100
Norway	101
Poland*	94
Portugal	92

## Quantified emission reduction obligations of Annex I countries